FEBRUARY 18, 1933

Railway Age

Founded In 1856

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Only P C & M C *Air Conditioning* Equipment combines all of these vitally important advantages into one installation . . .

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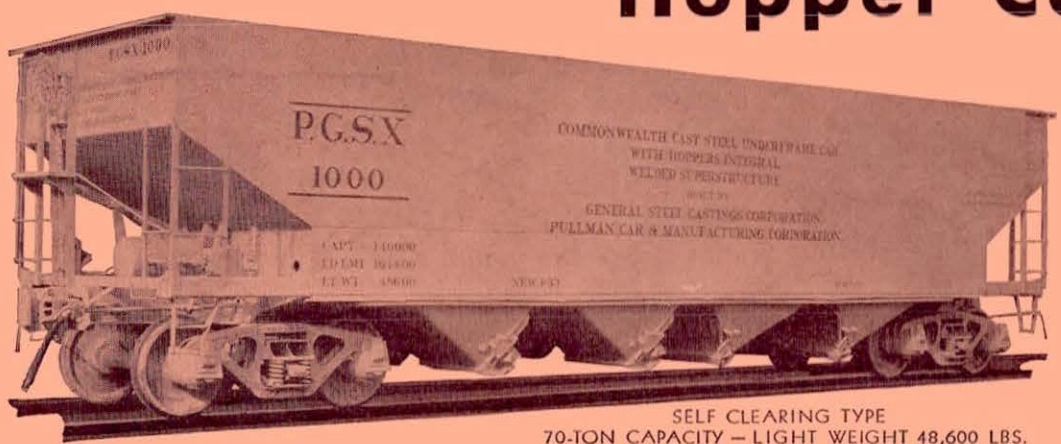

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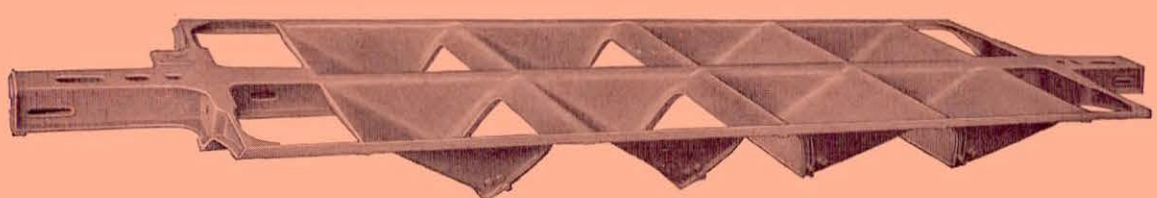

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NATURE SAYS: *"It is the most Economical Subdrain"*

A striking example of the efficiency of Armco Perforated Pipe. Track to the left of the platform is drained; one to the right is undrained

MEASURE the economy of Armco Perforated Pipe this way. It eliminates water pockets, prevents disastrous heaving, decreases mechanical wear of ties, and among other benefits, practically eliminates rail creepage and wave action.

A splendid example of its efficiency is illustrated on this page. Two tracks are shown. The track on the left is drained with Armco Perforated Pipe. The one on the right is not.

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Armco Perforated Pipe is manufactured from the Armco Ingot Iron of The American Rolling Mill Company and always bears its brand.

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New Locomotives

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Better Net Operating Income

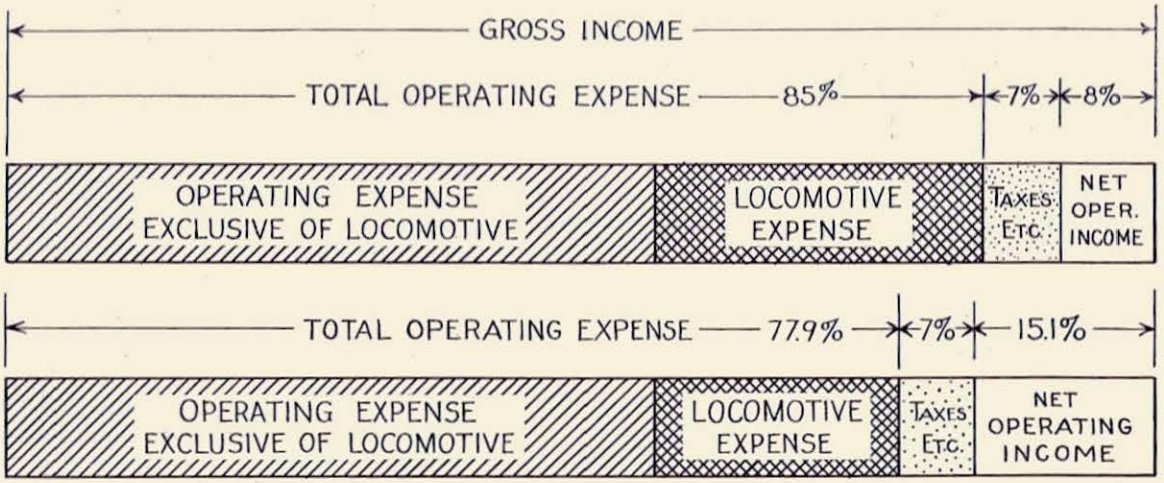

Chart illustrating the effect of a 25 per cent reduction in locomotive expense.

Assume a case as shown by the top graph, where the operating ratio is 85 per cent. The expense chargeable to locomotive performance is assumed to be one-third of the total operating expense and taxes and other expenses 7 per cent of the gross. You then have a net operating income of only 8 per cent of the gross.

If you reduce the locomotive expense 25 per cent as shown by the lower graph, what would be the result?

The operating ratio would be reduced from 85 to 77.9 per cent.

The net operating income would be increased from 8 to 15.1 per cent of the gross income — **an 88.7 per cent increase in net operating income.**

How can you reduce locomotive expense 25 per cent and also establish positive control over this group of accounts for the future?

1. By replacing obsolete power with modern locomotives designed to suit the service in which they are to be used.

2. By a systematic replacement policy which will renew the entire locomotive inventory at least once every twenty years.

It takes Modern Locomotives to make money these days!

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PHILADELPHIA

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An abstract of a discussion by A. I. Lipetz, who gives a revised method of easily applied coefficients to supplement Cole's ratios in the case of modern locomotives.

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An abstract of the findings of this investigating body, which was sponsored by fiduciary investors and of which the late President Coolidge was chairman.

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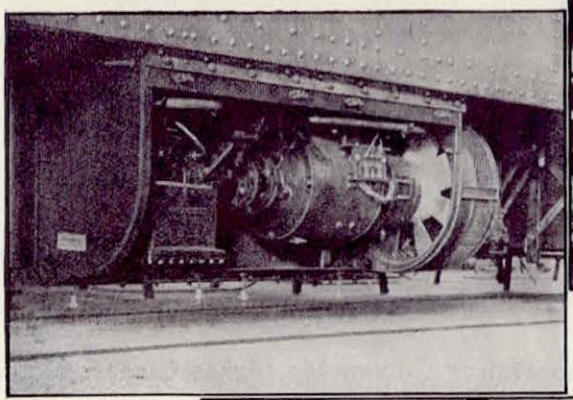
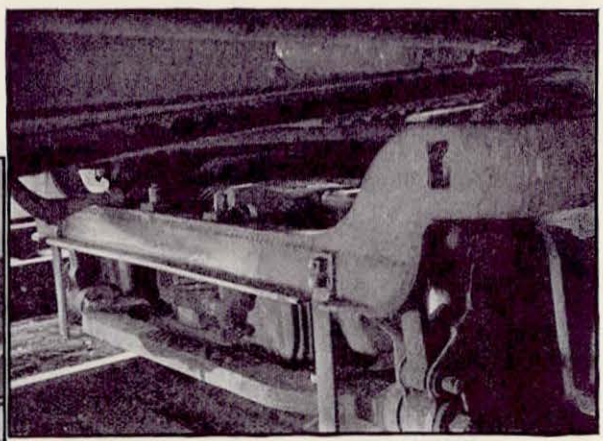
The MISSOURI PACIFIC *with*

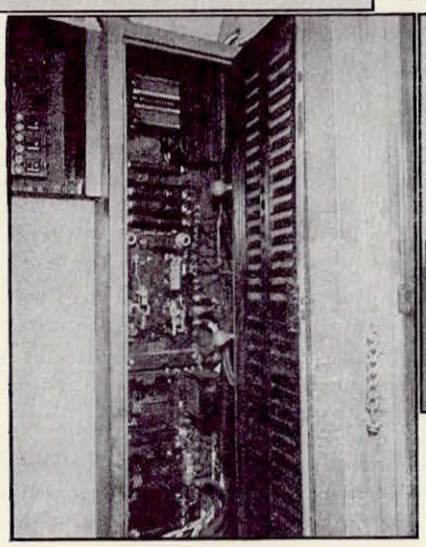
REFRIGERATING—*(below) The Refrigerating Unit mounts under the car floor—The a-c.—d-c. motor makes possible the use of terminala-c. power for pre-cooling of cars prior to departure.*

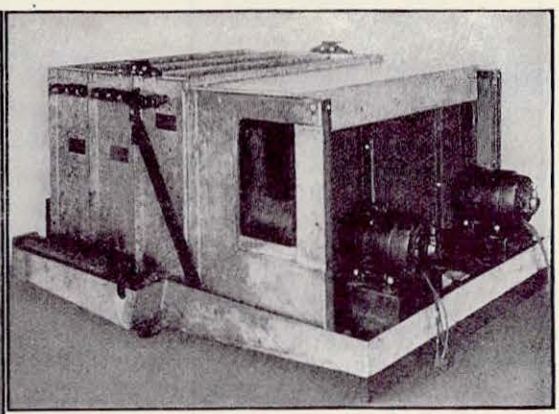




GENERATING—*(above) This 15-kw. gear-driven Axle Generator supplies ample power for air conditioning, car lighting, and battery charging.*

CONTROLLING—*The Control fits into existing lighting control cabinets.*





AIR CONDITIONING—*The Air Conditioning Unit, which fits into the car roof, cools, dehumidifies, and ventilates.*

COMPLETE AIR CONDITIONING

Tune in the thrilling new Westinghouse radio Serial by OCTAVUS ROY COHEN . . . NBC Network

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IN an initial order for passenger car air conditioning equipment, the Missouri Pacific has ordered two complete Westinghouse systems, comprising air conditioning units, refrigerating units, axle generators and control.

● Three additional Westinghouse 15-kw. gear-driven axle generators are also included in this same order.

● Westinghouse provides the first and only system of mechanical air conditioning that is complete from rail to roof—all designed, built, and guaranteed by a single manufacturer.

● The units of this system are compact and very light in weight, *but strength and ruggedness so necessary in railway service, have not been sacrificed.* They will fit any existing railway passenger car without major alterations to the car structure.

● This equipment, identical with that in service on two crack Illinois Central trains, has been thoroughly tested in our laboratories and on the road under every climatic condition and is backed by a service operating record of over 600,000 highly successful car miles.

● We shall be glad to have a Westinghouse Railway Air Conditioning Engineer bring you full details on our complete service.

EQUIPMENT — FROM RAIL TO ROOF

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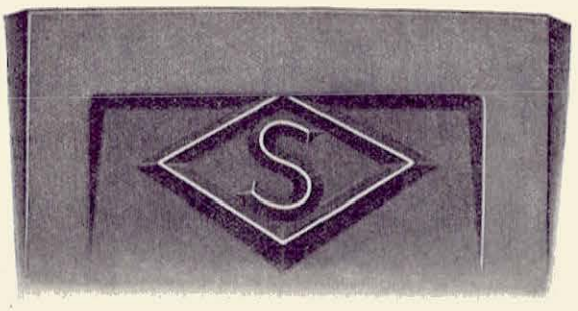

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"Diamond-S" brake shoes give more brake shoe miles on your passenger equipment than any other type of brake shoe. This means substantial savings.

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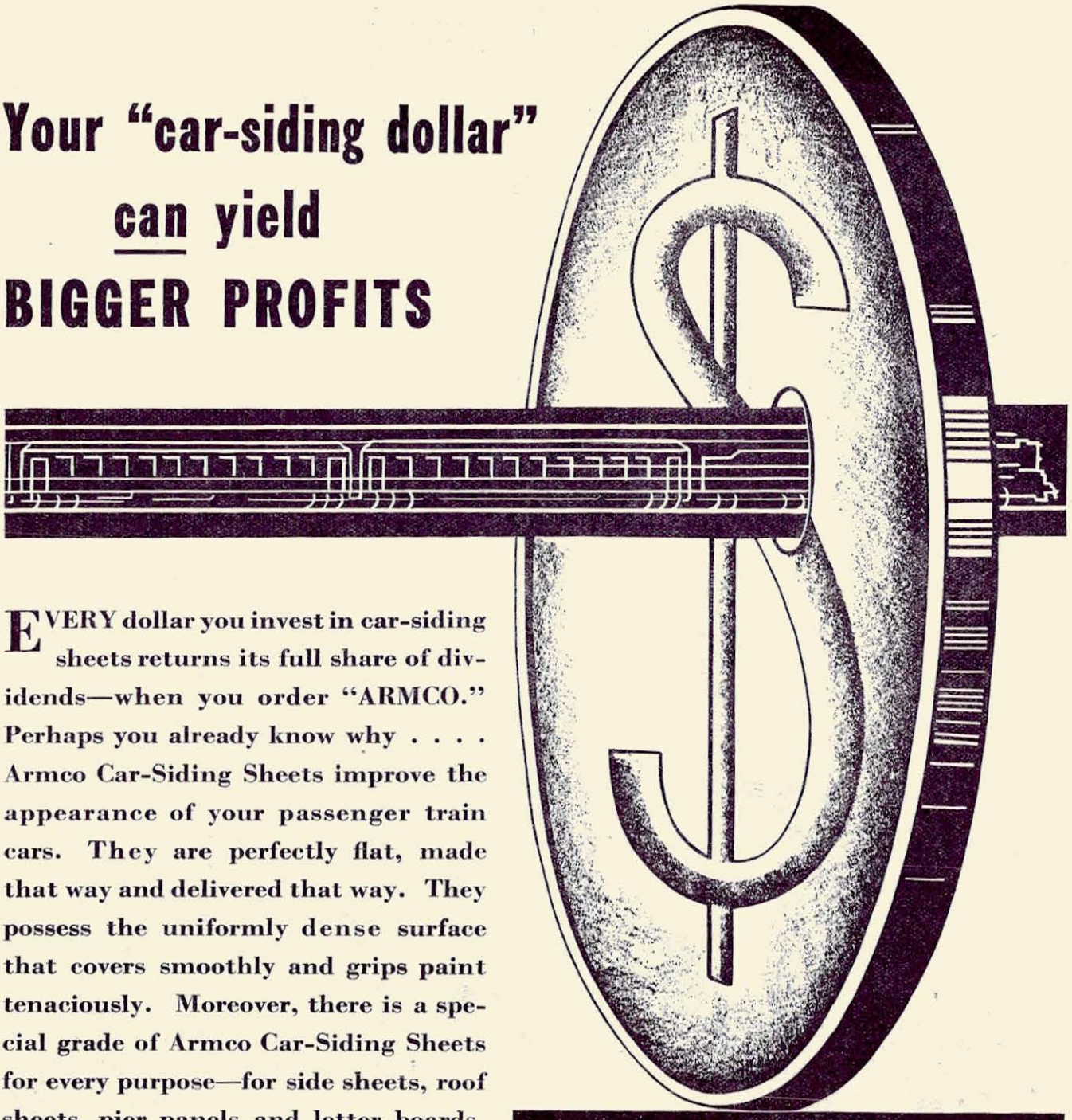

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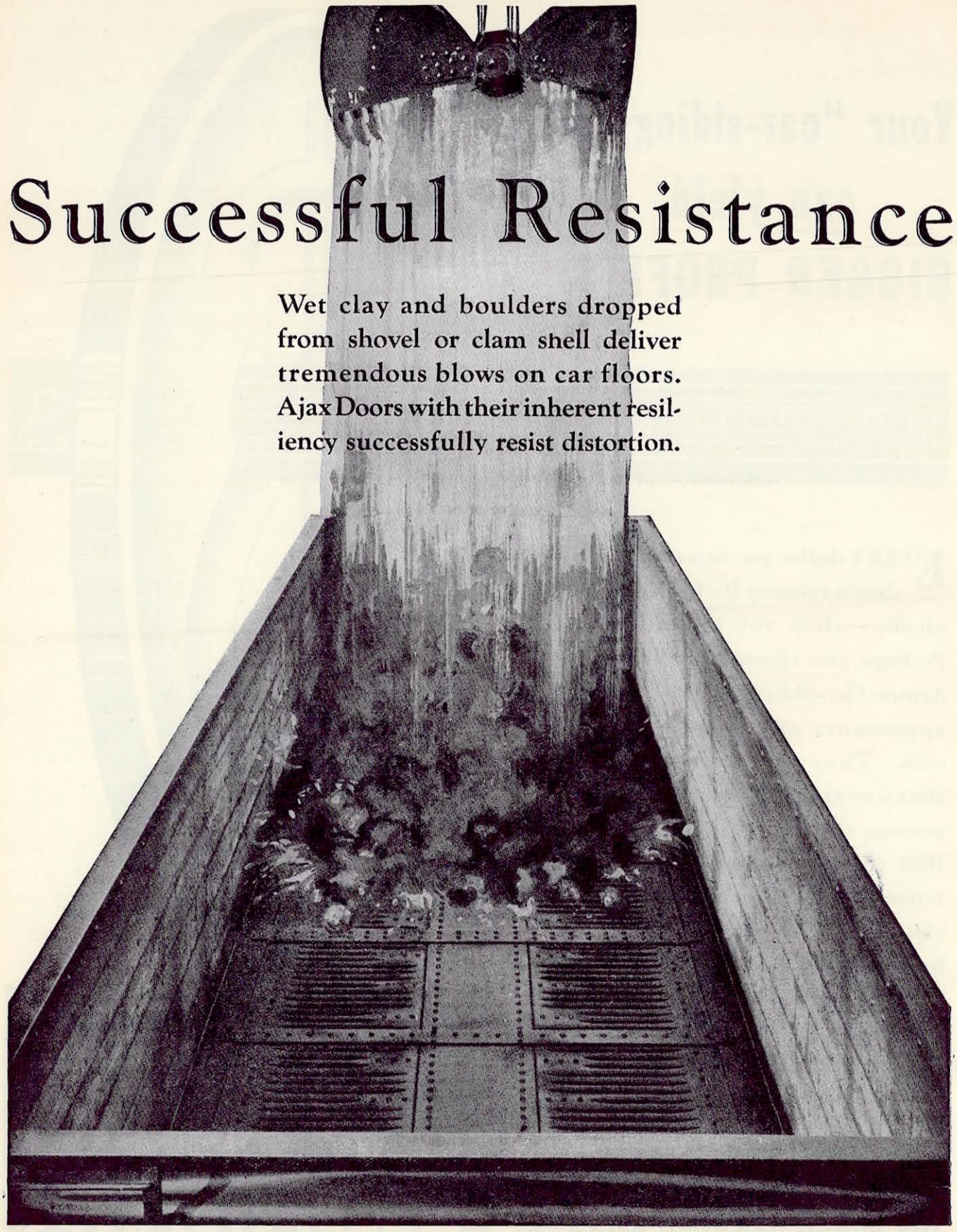
Successful Resistance

Wet clay and boulders dropped from shovel or clam shell deliver tremendous blows on car floors. Ajax Doors with their inherent resiliency successfully resist distortion.



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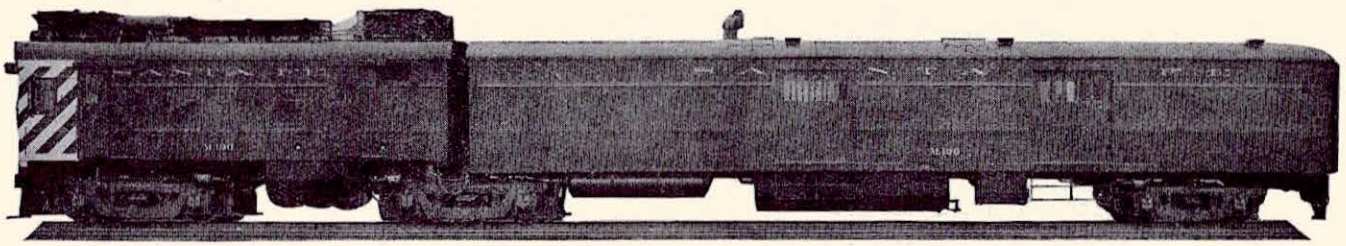
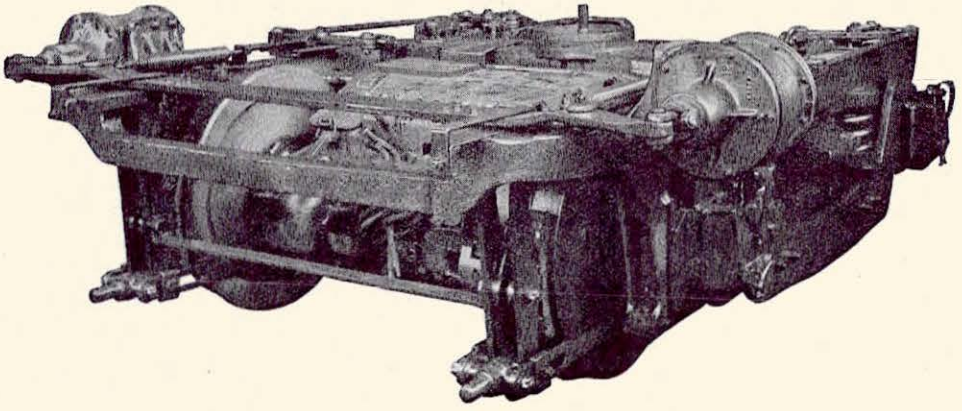
The Simplex Unit Cylinder Clasp Brake, manufactured by the American Steel Foundries, was selected by the Santa Fe for controlling their new 900 HP articulated gas-electric car.



This type of brake employs two air brake cylinders mounted on each truck, eliminating the use of body brake rigging, leaving that portion of the underframe between the trucks available for the application of oil reservoirs, electrical and other special equipment.



Unit Cylinder Brakes are particularly adaptable for use with gas and oil electric cars. They reduce vibration and noise, facilitate inspection and repairs, are free from interference with trucks swiveling on curves, and make possible shorter and smoother stops.

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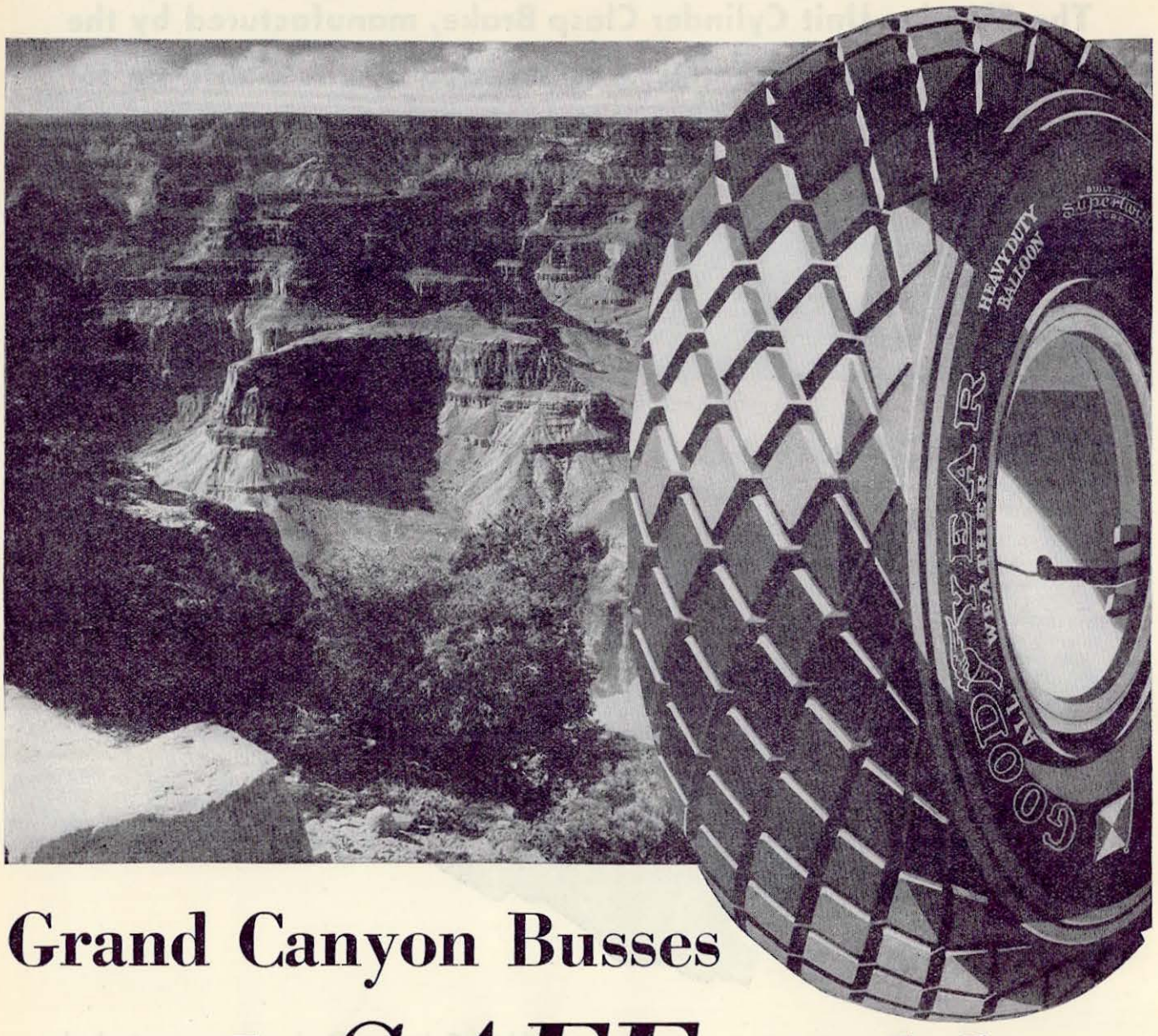


Grand Canyon Busses need *SAFE* rubber

That's why they're 100 per cent GOODYEAR

EVERY BUS of the Grand Canyon Transportation Department rolls on Goodyear Tires.

So does every water and gasoline truck, trailer and private car of the Grand Canyon fleet.

This has been true since 1920. Now see what J. E. Shirley, Transportation Manager at Grand Canyon National Park, says:

"Our reason for using Goodyear Tires is simply this: They have proven themselves best by test. We have found their service the best and their traction under all conditions excellent.

"Our continued use of Goodyear Tires only, is ample proof of the complete satisfaction they have given us."

Safety for tourists—economy mileage for the operator—*both* assured with rugged Goodyears—the only tires with the road-gripping center traction of the All-Weather Tread and the extra elasticity of Supertwist Cord.

See the Goodyear Truck and Bus Tire Service Station Dealer about the right size and type of Goodyear Balloon Truck or Bus Tires for your operation.

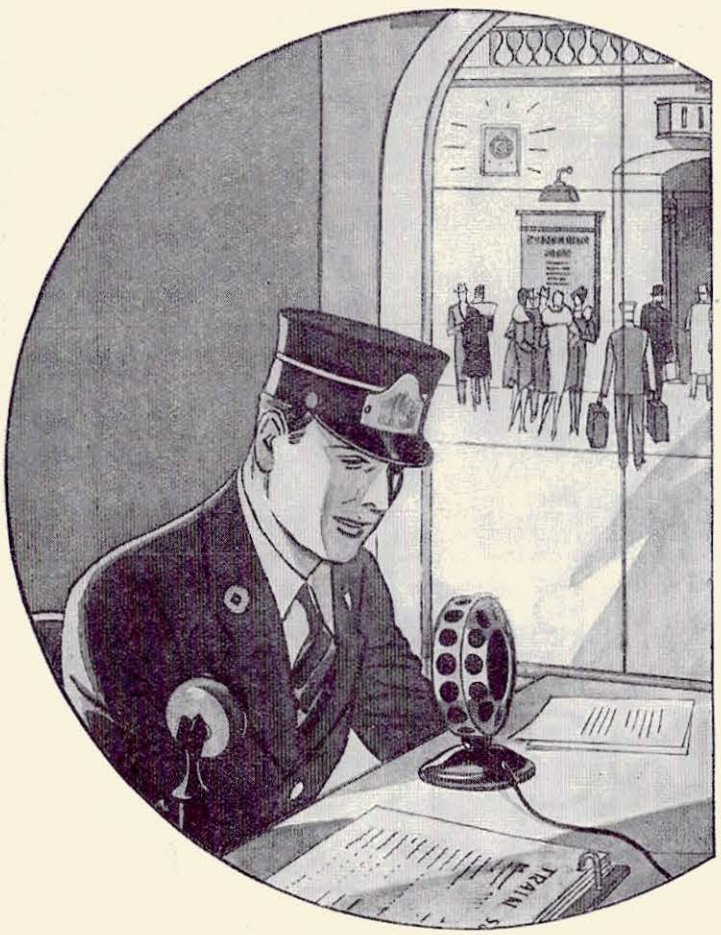
THERE'S A GOODYEAR FOR EVERY TYPE OF TRUCK, BUS OR TRACTOR

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TIRES THAN ON ANY OTHER KIND

Megaphone mouthings are out of date! . . . . .

Announce trains clearly via PUBLIC ADDRESS SYSTEM

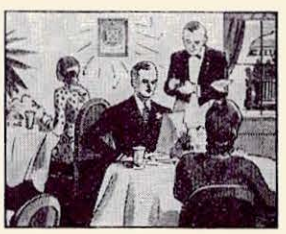


GIVE your train announcer a *microphone* instead of a megaphone! Western Electric Public Address System amplifies speech without distortion, distributes it through loud speakers to all parts of the station.

Train announcements are heard clearly wherever you provide loud speakers. Missed words will no longer cause missed trains!

A loud speaker outside your station calls taxis in short order. Another good-will-building use for your Public Address System.

Baggage and freight handling is easier, quicker — when you install Public Address equipment. It saves time, tempers and money!



Add a Western Electric Music Reproducer (plays phonograph records) — and the System supplies music for a few cents an hour to restaurant and other locations.

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PUBLIC ADDRESS AND MUSIC REPRODUCING SYSTEMS

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Gentlemen: Please send us the story of the Public Address System.

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ADDRESS.....

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APPLIED OVER 20 YEARS AGO AND STILL IN A-1 CONDITION

Here is a Universal Dry Lading Roof
Applied July, 1912, over 20 years ago
And still in A-1 condition.

If this roof without maintenance
Gives 20 years of continuous service
On a double sheathed **wood** car
Which car was repaired several times—
How much longer service will it
Give on an **all steel** car?
Probably beyond the wildest dreams.

FIGURE IT OUT FOR YOURSELF.

Hutchins Car Roofing Company

RAILWAY AGE

The Shannon Investigation

The special committee of the National House of Representatives on Government Competition With Private Business, of which Representative Joseph B. Shannon is chairman, made public on February 8 the first section of the report of its investigation, which summarizes the evidence introduced in its hearings. "The data collected by the committee itself," it states, "show at least 232 items of trade, industry and personal and professional service affected by governmental competition for which redress is sought. The evidence in general indicates that the operations of the federal government in the field of private enterprise have reached a magnitude and diversity which threaten to reduce private initiative and curtail the opportunities and infringe upon the earning powers of tax-paying undertakings, while steadily increasing the levies upon them."

Government Competition and Subsidies

A number of quotations are made from statements of business organizations and some statements are made by the Shannon committee itself, which are interesting and significant to students of the nation's transportation problem. Among these are the following:

Special Committee of the National Association of Manufacturers.—"The government ought not to engage, either directly *or through subsidies*, in the manufacture, production or purchase of commodities or *services* for sale in competition with private enterprise."

United States Chamber of Commerce.—"Grants of public money . . . for the special advantage of particular forms of business enterprise, in their competition with other lawful forms, cause unfair damages to private citizens in their lawful pursuits and *this damage cannot be offset either by pretended* or *realized benefits to other citizens or classes of citizens.*"

United States Chamber of Commerce.—"Every association of business men and every other field of interest that has sought activities upon its behalf, not in themselves properly governmental in nature, should withdraw its advocacy and support, and *should at its own cost provide for such of these activities as are warranted.*"

Shannon Committee.—There is need of "determination of a clear-cut governmental policy towards . . . waterways constructed or operated under public auspices for the purpose of preventing such organizations or undertakings, as the result of government subsidy, ownership or operation, from impairing the personal and property rights of private business."

Shannon Committee.—"Should government employes . . . desire to establish cooperative stores . . . or other enterprises . . . in government buildings or on government reservations . . . space should be made available to such cooperatives under competitive conditions, or, in other words, *at rentals which would be paid by any other private rental enterprise.*"

The committee said nothing in the first section of its report about subsidies to or regulation of commercial highway transportation. There can be no question whatever, however, regarding the applicability of the general principles enunciated by the National Association of Manufacturers, the United States Chamber of Commerce and the Shannon Committee to every single existing form of governmental competition with the railways or subsidy in aid of such competition.

How Principles Apply to Transportation

Railroads are a private enterprise. Transportation is a service rendered by railroads for sale. Therefore, every form of subsidy given by government to aid competition with the railways by air, parcel post, highway or water is condemned by the language above quoted from the statement of the National Association of Manufacturers. But are all manufacturers really in favor of applying to the business of transportation the principle of "no subsidies" which their association enunciated? If so, how can any of them continue to advocate the development of toll-free waterways? If the National Association of Manufacturers spoke for all manufacturers, how can any manufacturer of motor vehicles continue to contend that any commercial bus or truck should be allowed to use any highway in competition with the railways without paying a rental which will fully compensate the public for its use of the highway?

A waterway or highway is just as much public property as a public building. If government employes should, as the Shannon committee declares, be charged the same rental in public buildings for co-operative stores that they would be charged in private buildings, why should any carrier engaged in transportation for hire be allowed to use a waterway or a highway without paying fully for such use? And why should the payment made for the use of space in a public building be called "rental" by the Shannon committee, and the payment made for the use of a highway be called "taxes" by any body?

If it is true, as the United States Chamber of Commerce declared, that the "unfair damages to private citizens in their lawful pursuits" caused by "grants of public money . . . for the special advantage of particular forms of business enterprise in their competition with other lawful forms" "cannot be offset by

pretended or realized benefits to other citizens or classes of citizens," what becomes of all the claims made by business men that transportation by water is of such a nature that, by subsidizing it in order to make possible lower rates by water than by rail, there will be conferred benefits upon shippers, communities and territories which will more than compensate the public for the subsidies paid by it and for the effects produced upon the railways by the diversion of traffic from them?

Are Business Men Sincere?

If every association of business men, and every other field of interest should, as the United States Chamber of Commerce said, withdraw its advocacy and support of governmental activities upon its behalf, and "should at its own cost provide for such of these activities as are warranted," then, of course, all manufacturers and operators of commercial vehicles should cease to resist efforts to ascertain and impose adequate rentals for the use of the highways, and all business organizations and interests should cease to advocate development of waterways, excepting upon the condition that tolls sufficient fully to repay the taxes spent upon them shall be charged.

The Shannon committee did not go as far in making its recommendations for changes in present government transportation policies as the principles enunciated by business organizations in the hearings before it, and accepted by the committee itself, would have justified. It recommended that the postoffice department shall discontinue its practice of soliciting parcel post business and that all parcel post rates be placed on a basis that will provide revenues sufficient to cover the entire cost of the service. It recommended that the federal government shall retire from the operation of its barge line. It also recommended that the development of inland waterways shall be restudied "in the light of the development since the world war of new and additional transportation facilities." These are the only specific recommendations made by it in regard to government transportation policies.

The testimony presented before the committee and its report show, however, that it is the prevailing sentiment of the business men of the United States, and, also, the view of the committee, that the government should not engage in or subsidize competition with private business, and that men engaged in every kind of business are willing and anxious to have this principle applied to their own business. Unfortunately, professions and conduct are not always consistent, and heretofore many men who have been strongly opposed to direct or indirect government competition in their own business have been just as strongly in favor of direct or indirect competition in other peoples' business.

The *Railway Age* will believe that the business men of the United States are really opposed to government competition in business and to government subsidization of competition, when they definitely and specifically oppose continuance of every existing form of governmental competition or subsidization of competition with the railways, whether by parcel post, air mail, waterway or highway. The best test of whether men sincerely accept any principle is their willingness or unwillingness to have it applied to themselves in the same way as to others.

The "Coolidge" Board Reports

The much publicized National Transportation ("Coolidge") Committee has published its report, which is summarized elsewhere in this issue. The findings are laden with interest for all railroad men and, whatever else may be said of them, no one can deny their thoroughness, and the apparent freedom of the authors from prejudice.

Railway managements should be gratified to observe that the report adopts almost in their entirety, though not in such specific terms, the recommendations for the solution of the transportation problem presented by the railroads to the Committee at its December hearings. Ending the subsidies to inland waterway and highway transport, subjecting them to regulation and to some measure relieving the railways of their excessive burden of regulation are among the outstanding recommendations of the group. Regarding air transportation, the report does not go as far—believing that some subsidies are presently justified, but that it too should eventually be required to pay its own way.

When the appointment of this Committee was announced, the *Railway Age* expressed the hope that it would examine not only the external conditions affecting the railways but that it would also relentlessly inquire into and criticize any shortcomings in management. This portion of the committee's task it has certainly performed without stint. In the brief comment possible at this time we can make no attempt to weigh critically the many situations wherein, in the Committee's opinion, railway managements could improve conditions. The points made, however, comprise probably the most complete range of critical diagnosis which the railways have ever had from an unprejudiced outside authority.

The report for reasons it sets forth does not go thoroughly into the labor situation, but it says quite enough to arrest attention. Former Governor Smith adds zest to the findings by his separate concurring opinion, in which with characteristic vigor he states his opinions, those on the Interstate Commerce Commission making interesting reading indeed. Himself formerly a truck operator and close to automotive leaders, Governor Smith naturally went a little charily in his recommendations about regulating and "taxing" such transport. "Taxes" of such vehicles, he said, are already substantial and are being raised so that within a short time, in his opinion, they will be paying adequately for the use of the roads. This increase, however,—this Governor Smith did *not* say—is not being brought

about by motor bus and truck interests. These, on the contrary, are fighting it at every stage. It is being secured and can only be secured, by the efforts of railroad and taxpaying interests who will fight for a just redistribution of tax and benefit levies. The report of the "Coolidge" committee or any other such body, therefore, while helpful, in no measure relents the necessity for continued efforts by railroad men, shippers and tax-conscious citizens in forwarding their programs for transport equalization.

Only One Sure Defense For Railway Labor Standards

The railways are disadvantaged in meeting the competition of other forms of transportation by—

1. Regulation to which they must submit but from which their competitors are free.

2. The fact that they must pay all expenses incident to railway service and heavy taxes in addition, in contrast with competitors, who, generally speaking, pay no *net* taxes whatever and, moreover, have a generous share of the cost of their service defrayed out of general tax funds.

3. The higher standards of wages and working conditions on the railways, as compared with those of competing forms of transport.

It is difficult, if not impossible, to say definitely which of these handicaps is the greatest. They are all important and all must be dealt with if transportation is to be placed on a sound footing. Indications are that progress in the removal of the first handicap may be expected relatively soon. This is true because the issues involved are fairly well understood and a growing body of champions of equitable regulation of all forms of transport is to be found, not only among railroad men and shippers but among many of the railroads' competitors as well.

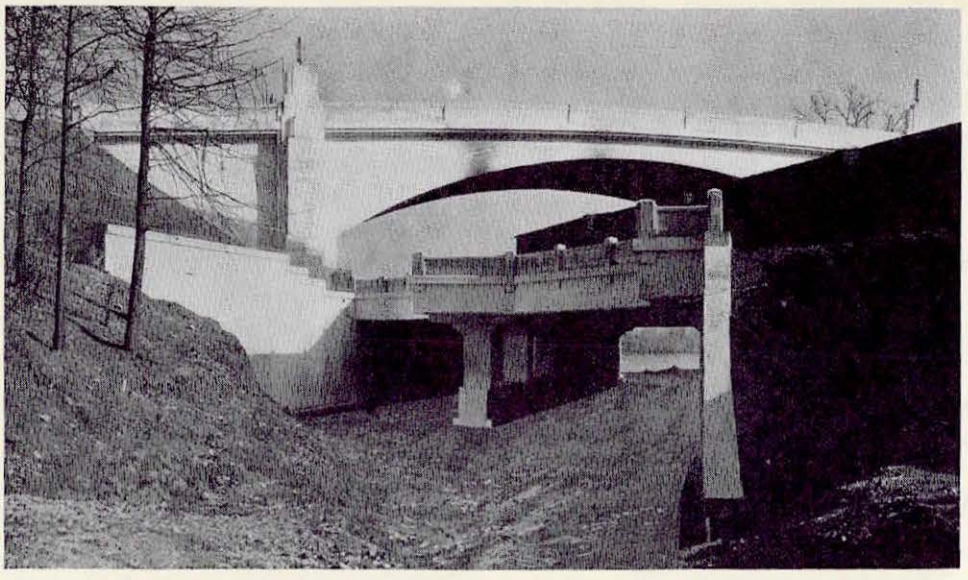
Progress in meeting the second difficulty—that of overtaxation of the railways and subsidies to their rivals—is more difficult of achievement. This is true largely because of the prevalence of deliberately deceptive propaganda to confuse in the public mind rates and true costs; and to produce similar misunderstanding of the fact that fees or rentals for the use of governmental facilities as a place of business—in which category fall license fees paid by truck and bus operators—are not comparable with taxes for general governmental purposes which the railways pay. The distinction in these concepts is one which a child can understand, once it is explained to him. Those who once learn the facts of this situation never recant, and the ranks of understanding are constantly augmented by an influx of payers of bona fide taxes who, impoverished for the benefit of feeders at the public trough, are seeking the cause of their woes. They do not have far to look. Ultimately at least, therefore, it would seem this second handicap of the railways also should largely disappear.

The third obstacle—that of much higher wages and working conditions on the railways than those of competing forms of transport—has thus far received far less attention than it deserves. Even the organizations of railway labor seem to accord it but slight importance. And yet it appears that competition for jobs has beaten wages down in motor transport to the point that instances have been noted of such workers giving their services for upwards of twelve hours daily at a bare subsistence wage. A recent study of wages paid on inland waterways shows payments but little greater than those obtaining on the railways 19 or 20 years ago.

In 1913 railroad employees had average annual earnings of $761. In 1931 their average earnings were $1662, or almost 2⅕ times as much, and the standard day was eight hours in the latter year, as compared with ten hours in 1913. And this railway labor, which has so raised its standards, is endeavoring to compete with other transport workers who are glad to work for wages and hours which are apparently comparable with pre-war railroad standards.

If the 1,260,758 employees who were employed by the Class I railroads in 1931 had been paid $761 on the average, as they were in 1913, instead of the $1662 they actually received, the saving would have totaled well over one billion dollars. If this sum had been made available for rate concessions on traffic competitive with other forms of transportation, it appears highly probable that, with such large rate concessions, most of this tonnage could have been retained for the railways. The inequality in standards of labor, it would seem, therefore, is one of the major causes of the decline in railway traffic and employment.

Let no one think for a moment that the *Railway Age* advocates lowering railway wages and working conditions to any such level, but we do maintain that the disparity between railway labor and that of competing transport must be removed as a condition precedent to the reestablishment of our national transport system on a sound basis. To the extent that equalization of regulation and taxation fail of achievement, the more pressing becomes the necessity for an equalization of wages and working conditions as a means of retention of railway traffic. The inexorable fact that faces every man on the railroad payroll is that only to the extent to which he and his fellow employees will aid in bringing about more adequate regulation and taxation of competing transport and in raising *their* standards of employment can he hope to hold his job and maintain his wages and working conditions at anything approximating the present level. This aspect of the railway employee's situation transcends all others in importance. It is frivolous for organizations, supposedly working in the interests of the employees, to spend their time and dissipate their energies in chasing such rainbows as "full" crew laws and six-hour days, while they give but casual attention to the one course of action which, in the long run, can really safeguard railway employment and labor standards.



The Triaxial Crossing on the Lehigh Valley Involving Roadway Crossings Both Above and Beneath the Railroad

Three-Level Crossing Involves Interesting Bridges

Unusual flat-slab structure carries Lehigh Valley over new highway, while graceful concrete arch spans tracks directly above

By A. Burton Cohen
Consulting Engineer, New York

A THREE-LEVEL railroad-highway crossing involving the construction of two interesting reinforced concrete bridges, one directly over the other, has just been completed on the main line of the Lehigh Valley about a mile west of its Meeker Avenue station in Newark, N. J. The work required the joint participation of the railroad, the Essex County Park Commission and the New Jersey State Highway Commission.

Specifically, the project involves a flat-slab bridge with floor panels of unprecedented size, 28 ft. by 35½ ft., which carries six tracks of the railroad over a new state highway route projected under it at the acute angle of 28 deg., and a four-rib arch, with a clear span of 122 ft., which supports a park drive over the railroad and the new highway. There are a number of features in the design of the flat-slab railroad bridge which are distinct departures from conventional design.

Triaxial Crossing Found Most Feasible

In close proximity to the site selected for the new highway undercrossing, there existed a structural steel deck-girder bridge over the railroad, built about 30 years ago along a narrow ridge, carrying a park drive which connects parts of Weequahic park developed on both sides of the railroad. Because of the splendid park development in this vicinity, it was necessary to locate the new highway immediately alongside the railroad, which accounts for the acute angle of its crossing of the railroad.

In the plan adopted, the highway undercrossing of the railroad was placed directly underneath a new park drive bridge, in the same location as the old one, and was made to pass diagonally between its supports. To have located the undercrossing either side of the park drive bridge would have involved serious difficulties and largely increased costs. The triaxial arrangement of crossings was particularly desirable from the standpoint of foundations, since directly beneath the park drive bridge there is a narrow ridge composed of compact gravel, which was found to be suited for foundations without resorting to piling.

The new park drive bridge is a reinforced concrete arch of permanent value, with a span of 122 ft., and is constructed at right angles across the right-of-way. This new structure just clears the back walls of a flat slab bridge carrying six tracks over the diagonal undercrossing of the highway. If the arch were to be built alone, without the undercrossing, no shorter span than 122 ft. would have been possible to obtain the vertical and lateral clearances required by the railroad for a future eight-track layout.

Details of Railroad Bridge

The flat-slab railroad bridge spans two parallel one-way roadway lanes, each 30-ft. in width, separated by a line of columns which forms the center support for the

double-span railroad deck. No sidewalks are provided along Route 29 since it is an express highway.

The principal departure from common practice in the design of the flat-slab bridge and its attending features is in the elimination of the mass-type abutments commonly used in such undercrossings. These were replaced on each side by a line of rectangular columns set back nine inches from the outer curb line. This arrangement fixed the transverse panel span at 35 ft. 6 in. Lengthwise along the center bent, there are 10 columns spaced 28-ft. center to center. The slab thickness required for these 28-ft. by 35½-ft. panels is 32 in., exclusive of 14-in. drop panels over the columns.

The slab deck extends 6 ft. beyond the center line of the outside column bents where it terminates in a so-called "depending slab," which is cantilevered downward 10 ft. 8 in. from the top of the slab. This depending slab acts as a back wall to resist the major portion of the horizontal thrust of the earth backfill and surcharge live load. Furthermore, the depending slab on each side, with that portion of the floor slab extending beyond the center line of the columns, forms an angle of considerable stiffness and torsional restraint. In its extended position it gives balance to the column moments due to eccentric loadings, reduces slab moments, and adds to the stability of the columns by the exclusion of lateral earth pressures.

Employ T-Beam Footings

In combination and functioning with the depending slab there is an inverted continuous T-beam footing upon which the columns are superimposed. This beam projects above the roadway surface to minimize foundation excavation and to take that portion of the horizontal pressures which escapes the depending slab. This lateral pressure is comparatively small and is resisted by frictional resistance along the base of the footing beam. The applied column concentration gives practically uniform pressure across the footing beam which was limited to three tons per square foot. In projecting the footing beam above the roadway, the columns were reduced to short pedestals, adding greatly to the stiffness of the fixed end support.

To take the slight overflow of the backfill between the bottom of the depending back wall and the top of the continuous projecting footing beam, a 12-in. curtain wall was built on top of the footing beam, between columns, and was extended upward to the bottom of the column capital flares. This wall hides the pockets formed between the columns and the back wall and adds an architectural feature.

Despite the angular distortion of the skew bridge, it was possible to arrange the column spacing to obtain rectangular panels throughout, with the exception of two triangular panels at each portal. These triangular panels take very little live load and extend little beyond a standard lateral clearance of eight feet beyond and parallel with the center line of the outside track.

To some extent, the shaping of the structural parts of the flat-slab bridge in adjusting them to grade, curvature and angular distortion, point toward unlimited possibilities of reinforced concrete in bridge design. The forms for the rectangular depending slabs and inverted T-beam footings were easily shaped to the highway curvature. Here the transverse center lines of the columns were placed on radial lines, and, furthermore, the deck slab, of uniform thickness, was placed parallel with the 0.24 per cent grade of the railroad, making it possible to maintain a uniform depth of track ballast on the bridge. The balancing and continuity of parts, and the use of rigid end connections, tend to improve greatly the stability of the structure and to create economic results.

Design of the Railroad Structure

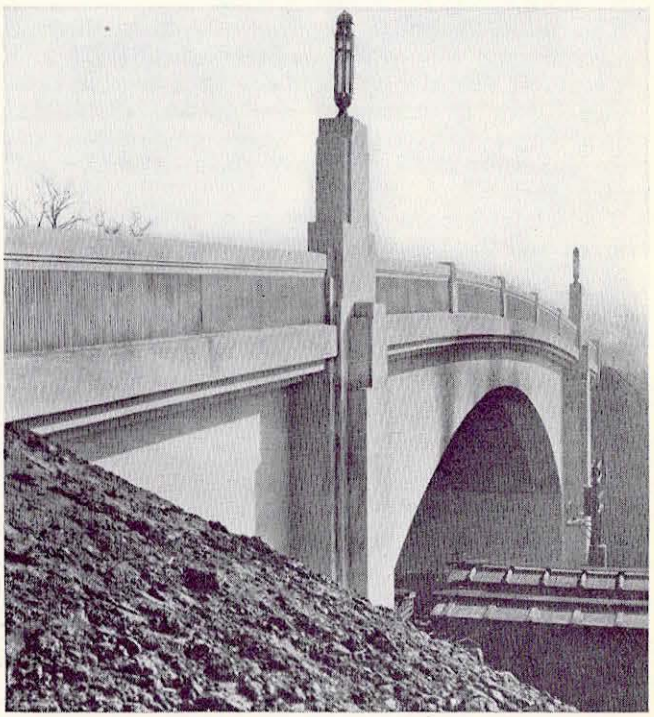
The railroad bridge was designed for Cooper's E-70 loading, which was found to have an equivalent uniform loading of 800 lb. per square foot in continuous beam action over the average span of the rectangular panels. The average impact increment figured for the slab was 63 per cent of the live load. The 32-in. slab has a four-way system of reinforcement, with direct and diagonal bands composed of 1¼-in. square bars crossing the full width of the column drop panels, and with a major portion of the bars bent up over the columns to take negative moment.

The square columns are designed for both direct load and the moment resulting from both full and partial loading of the structure. The vertical reinforcement in the 4-ft. by 4½-ft. columns is four per cent of their area and consists of 1¼-in. square bars.

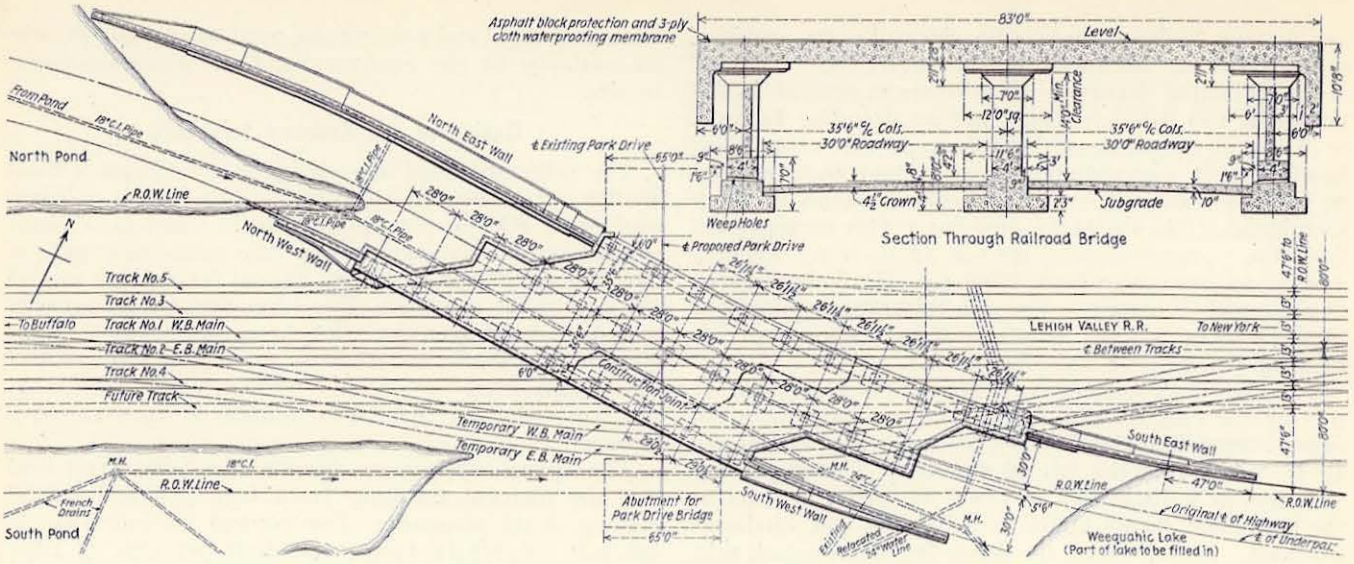
The uninterrupted flat surface of the bridge slab was water-proofed by a built-up membrane composed of three plies of asphalt-saturated cotton cloth laid in four swabbings of hot asphalt. This was protected from abrasion by the stone ballast by a covering of asphalt paving plank, also swabbed with hot asphalt. Where the membrane was placed on vertical surfaces it was faced with a layer of common brick laid in cement mortar. The projection of the slab beyond the outside column lines affords good disposition of the deck drainage, which is directly into the embankment. The usual drip over the back walls and bridge seats of structural steel girder bridges will not be encountered.

Good Daylighting of Undercrossing

In spite of the length and width of the new undercrossing, it is afforded unusually good daylighting. Nine of the 14 panels composing the floor slab, that is, 4½ panels at each end, receive daylight from side openings owing to the triangular end sections of the slab. There



A Graceful Concrete Arch Over the Railroad Replaces an Old Girder Structure



General Plan of the Triaxial Crossing, Showing Features of the Railroad Bridge Layout—Also a Section Through the Railroad Bridge

are only four full two-span panels, having a total length of 112 ft., where daylight is not admitted from the side. The flat exposed surfaces under the structure, however, give the best possible reflection of the light available.

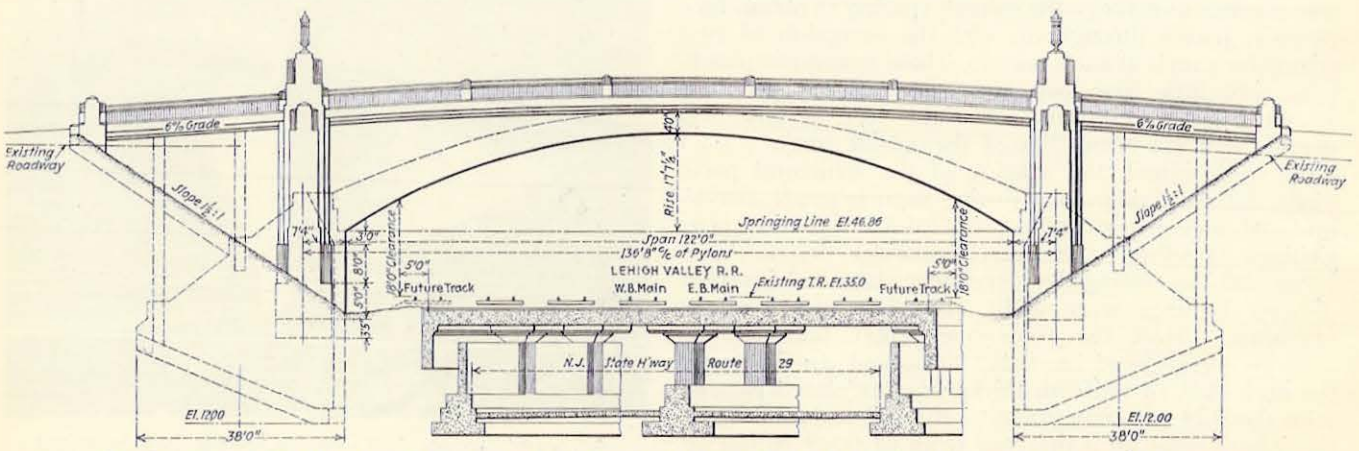
To insure adequate light within the undercrossing under all conditions, a dual system of lighting has been provided. One system is composed of seven lights, and is intended to be used on dark days. The other system includes 15 lights, all of which will be lighted during the night. The lights, which are hung from the under side of the slab, are staggered along the column lines, and, in this position, tend to furnish indirect lighting.

Approximately 4,320 cu. yd. of concrete and 816,000 lb. of reinforcing steel were used in the railroad bridge proper. This is exclusive of approximately 725 cu. yd. of concrete used in retaining walls. The concrete was divided into three classes, 3,000-lb., 2,500-lb. and 2,000-lb.; the 3,000-lb. concrete being used exclusively in columns, and the 2,500-lb. concrete being used in all other work except the retaining walls.

The cost of the bridge, exclusive of drainage, highway excavation and wing walls, was approximately 25 to 30 per cent less than the estimated cost of a structural steel bridge having an unencased deck girder I-beam floor system with a concrete slab deck, supported on mass concrete abutments and a reinforced concrete multiple-arch center bent.

The reinforced concrete park drive arch spanning the railroad and the highway undercrossing of the railroad is of rib construction, with a clear span of 122 ft., and carries a 40-ft. roadway and two 8-ft. sidewalks. Four 4-ft. arch ribs support the deck slab, which is also of flat-slab construction, 12 in. thick, shaped to the vertical curve of the roadway longitudinally, and to the crown of the roadway transversely.

The arch abutments, which were carried down to the level of the foundation for the railroad bridge, because of the close proximity of the two foundations, are of skeleton construction, built about four buttresses in line with the arch ribs, and of the same width. The buttresses distribute their loads over the gravel foundation through a continuous footing slab set on an inclined plane approximately normal to the lines of pressure through them. The parapet walls of the abutment, 1 ft. 9 in. in thickness, are held in place by two counterforts anchored to the abutment ribs and cantilevered from the end counterfort to give the required length to retain the back fill of the highway embankment on a slope of 1½ to 1 to the sub-grade of the railroad. The exterior effect is that of mass construction. The cost of the arch bridge was approximately $70,000. The railroad bridge was built in two stages about a construction joint transversely through the slab, as indicated on the plan, this method being necessary to the continuance of uninterrupted train operation. In the first stage, the old park drive bridge was taken out of service and dismantled, and two detour tracks, to permit uninterrupted train movement, were swung out to one side of the four exist-



Side Elevation of the New Park Drive Bridge, With Sectional View of the Railroad Bridge and Highway Undercrossing

ing main tracks on a widened fill. This relocation of tracks permitted the construction of the first half of the railroad bridge.

While this portion of this bridge was being built, the arch abutment on the same side of the right-of-way was constructed. Upon the completion of this work, two permanent tracks were laid over the completed half of the railroad bridge and placed in service, making unnecessary the further use of the detour tracks. Then excavation for the second stage of the work was started, consideration being given first to the completion of the arch bridge since the railroad was now taken care of satisfactorily for the time being, and since the absence of the park drive bridge was causing users of the park drive considerable inconvenience.

Single-span structural steel arch centering of the three-hinged type was used in constructing the arch ribs, only two of the ribs, or half of the bridge, being poured at one time in order that the same centering could be re-used on the second half of the arch. The use of full-span centering made possible not only uninterrupted train operation during the construction of the arch, but also continued progress on the construction of the second half of the railroad bridge directly beneath.

The work in connection with the railroad bridge was carried out under the direction of G. T. Hand, chief engineer of the Lehigh Valley, assisted by W. R. Johnston, engineer of grade crossing elimination, and W. H. Ramsey, resident engineer, who was in charge of construction in the field. The work on the arch roadway bridge was directed by J. H. Philips, chief engineer of the Essex County Road Commission, who was represented in the field by J. C. Malay, resident engineer. Supervision on the part of the state of New Jersey was given through the office of Jacob L. Bauer, state highway engineer. The plans were developed in the office of the writer, who collaborated with H. T. Rights, bridge engineer of the Lehigh Valley, in connection with the design of the railroad bridge. H. K. Wilson was principal assistant to the writer in the design of both bridges. The Rust Engineering Company, Pittsburgh, Pa., built both bridge structures, under separate contracts.

Senator Couzens Investigates R. F. C. Loans

WASHINGTON, D. C.

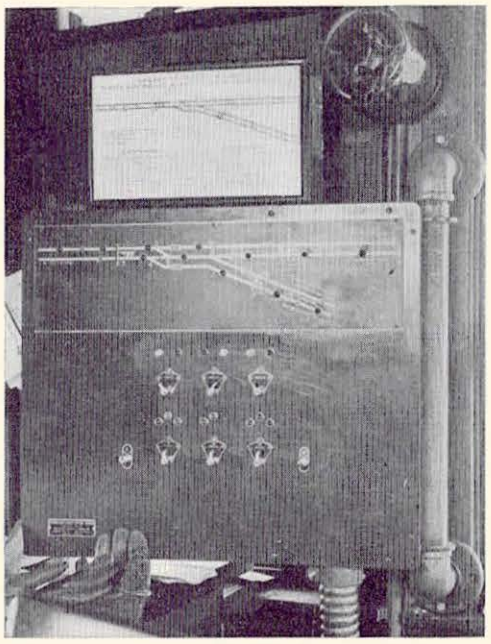
HEARINGS in connection with Senator Couzens' personally-conducted investigation of Reconstruction Finance Corporation loans to railroads, based on his resolution to suspend all such loans until Congress shall otherwise provide, were resumed on February 9 and 10, after which he stated that he did not expect that additional hearings would be necessary, but officially the hearing was adjourned subject to call. After most of the witnesses had expressed the opinion that it would be disastrous to cut off further railroad loans Senator Couzens said his resolution was not directed particularly against the railroads, but that he had picked out railroads because of his familiarity with the subject as chairman of the Senate committee on interstate commerce and that it was intended rather as a means of making an inquiry into the whole question of the use of government credit through R. F. C. loans. It was brought out, however, that his investigation had had the effect of causing the corporation "in deference to the committee" to postpone action on several railroad loans that had been approved by the Interstate Commerce Commission recently.

The hearing was conducted by Senator Couzens as chairman of a sub-committee of the banking and currency committee. Senator Goldsborough was also present part of the time. Senator Couzens said he had about reached the conclusion that the federal government "has got to get back of the debt structure for all or stop preferring particular groups," but Arthur A. Ballantine, Under Secretary of the Treasury, told him that loans were being made to railroads, banks, and other financial institutions on the theory that they represent "key situations" and that if they are helped other situations will be helped at the same time, "whereas if you diffuse your resources," he said, "you may accomplish nothing." The resumed hearing was called after the Senator had received a report from the corporation showing the market or estimated value, as of January 28, of the collateral pledged by railroads for their loans, regarding which he questioned M. C. Kennedy, chief examiner of the railroad division of the R. F. C., and Commissioner C. D. Mahaffie of the Interstate Commerce Commission. He brought out several instances in which the market value was far below the amount of the loan but Mr. Kennedy said it was important to distinguish between the market value and the real value and that the loans had been made only after a searching inquiry both by the commission and by the corporation which had satisfied them that the government was adequately secured. Senator Couzens questioned as to whether Congress had intended to have them "speculate" as to the future earning power of the railroads, and he indicated that he did not think much of some of the securities which Mr. Kennedy thought possessed considerable value, but he did not indicate as to whether the examples which he brought out were typical of the relation between the value of the collateral and the amount of the loan.

Alfred P. Thom, general counsel of the Association of Railway Executives, who testified on February 9, not only opposed the resolution, saying that to single out the railroads and abruptly stop making loans to them would result in catastrophe, but he said he hoped that a spirit would obtain in Congress in favor of extending loans to railroads, until a readjustment of their capital structure can take place, based on other considerations than the banking collateral they can provide. He said that perhaps, in their efforts to comply with the public demand for increased transportation facilities in the period following the war, and on the assumption that it was their duty to provide for the transportation needs of the country, some of the roads had over-supplied themselves and that their capital structures had in some instances become top-heavy. There is a bill pending, he said, by which that can be readjusted, but it ought not to be done at the bottom where it can be postponed, although there are some instances where it cannot be postponed. If the reorganization bill is passed, he said, plans will be brought forward for scaling down the capital obligations of certain carriers and provision should be made that loans made by the government for such essential purposes as the payment of taxes and fixed charges should be recognized in the reorganization.

When Mr. Thom said that the continuation of rail transportation is still essential to the public welfare, in spite of the theory so often heard that the motor vehicle could handle the traffic of the country, Senator Couzens interrupted, saying there was nothing in the resolution about abolishing the railroads. Mr. Thom said, "No,

(*Continued on page 241*)



The Control Machines are of the C. T. C. Type

Two Groups of Consolidated Interlockings

Save the C. M. St. P. & P. $10,730 net annually on an investment of $27,185 . . . . An attractive self-liquidating project

TWO remote-control interlockings, which together effect an immediate pay-roll saving of $10,348 annually, were installed recently by signal department forces of the Chicago, Milwaukee, St. Paul & Pacific, near Chicago. These two plants, although separated by 10 miles of line, and, from an interlocking standpoint, in no way combined, are closely related in that they are both involved in the operation of an important cut-off on the Milwaukee.

The Milwaukee operates a double track line between Chicago and Milwaukee and another line west from Chicago through Elgin. At Techny, 20.6 miles north of Chicago on the former line, and at Bensenville, 17.4 miles west of Chicago on the latter line, a double-track line of the Chicago & North Western crosses over these two radial lines of the Milwaukee. During the period of federal control, the Milwaukee began operation of trains over the North Western line between Techny and Bensenville, thus securing a shorter connection between its principal classification yard at Bensenville and its Chicago-Milwaukee main line.

In normal times, the Milwaukee sends 12 to 15 freight trains daily over this cutoff, while the North Western's traffic, consisting normally of approximately 25 trains daily, uses this line as a principal entrance to its main classification yard at Proviso, a few miles south of Bensenville.

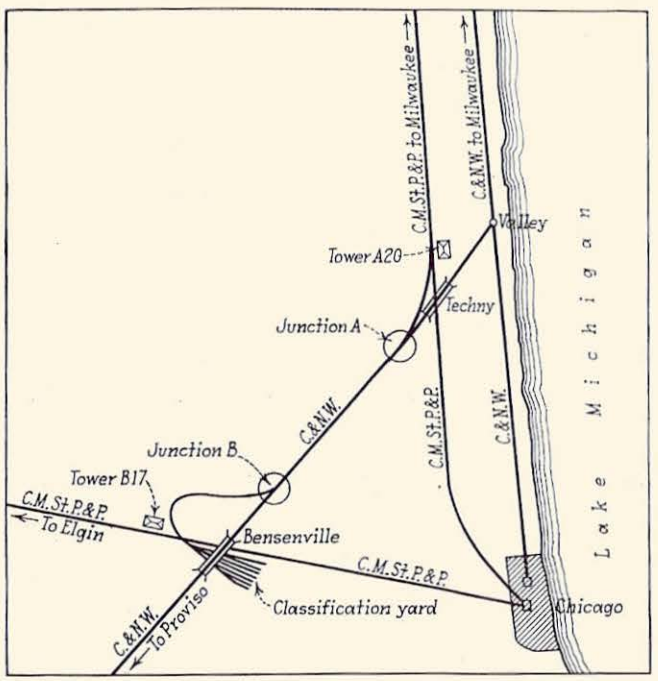
Formerly Four Mechanical Plants

In order to tie in with the North Western at the two points mentioned, the Milwaukee constructed the connecting tracks shown in the single-line diagram. Because of the heavy volume of traffic prevailing at that time, 1918, and because of the necessarily great length of each of these connecting tracks, a mechanical interlocking was at that time installed at each of the four junction points. Thus, at Techny one such plant, designated as A-20, was required at the junction of the double-track connecting line with the double-track main line of the Milwaukee, and at the other end of this same connecting track a mechanical plant, known as Tower-A, was installed at the junction with the North Western's line. Similarly, at Bensenville, two mechanical interlocking plants were required. In order to permit trains to pull in and out of the Bensenville yard, the main-line end of this connecting track was curved to form a reversing loop rather than a wye connection.

In 1928, the interlocking tower at Junction B, the northerly junction at Bensenville, burned, and from that time to the date of the installation of the present remote-control interlocking, this junction was operated manually by three switchmen, one on each trick. Naturally, this method of handling the junction switches was undesirable from the standpoints of economy and safety.

Changed to Remote-Control

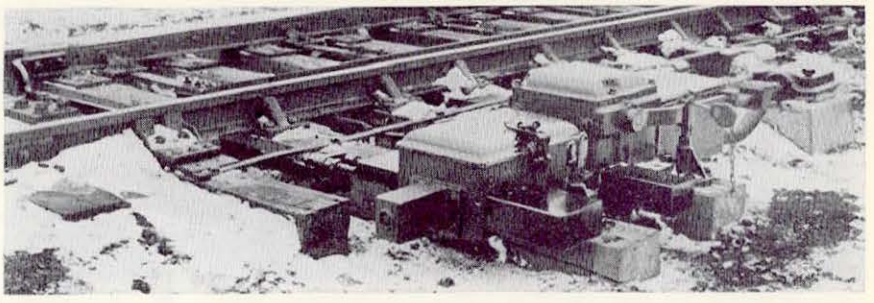
Taking advantage of modern developments in centralized traffic control and remote-control interlocking, the Milwaukee decided to control Junction B from the existing Tower B-17, and Junction A from the existing tower at Techny, eliminating the switch tenders at Junction B and the electro-mechanical plant and its attend-



Single-Line Diagram Showing the Two Junctions Involved in the Interlocking Rearrangement

ants at Tower A. Thus, the services of three switchmen were dispensed with at Junction B with a labor-saving of $5,113 annually, and in their place a remote-control interlocking was installed at a cost of $14,121. Allowing for operating and maintenance expenses and depreciation, the net annual return on the Bensenville layout is 33 per cent. At Techny, where a new remote-control system replaced an electro-mechanical plant, $5,234 was saved annually in operators' wages, and the cost of the new interlocking was $13,272. The rate of saving here, after allowing for operating and maintenance expenses and depreciation, and with proper accounting of the retirement of the equipment in the former plant, is 46 per cent annually.

From a design standpoint, the two remote-control interlockings are almost identical, for each layout consists of a junction of two double-track lines. The description of the interlocking system employed will therefore be confined to one of the interlockings—that at Junction B, Bensenville.



Union Type-M22 Dual-Control Switch Machines Were Installed

Dual-Control Switch Machines

The two crossover switches and the two turnout switches are operated by Union Switch & Signal Company Type-M22 20-volt d-c. 16-sec. dual-control switch machines. The semaphore signals, which were a part of the former plant, were left in position on the signal bridges and are used in the present interlocking, but new color-light dwarf signals were installed for governing the back-up moves, those on the Milwaukee being of the searchlight type, and those on the North Western of the unit type. It will be noted that the high signals in each case are for the left-hand track (although located a little to the right thereof), the reason being that the North Western runs left-handed. The lower unit of each of the high signals is a call-on signal for the North Western only; this arm clears in case of a failure of the top arm. The distant signals, which were used in the former plant, were left unchanged, except, of course, for slightly revising the circuits.

Control Machine of C. T. C. Type

All of these functions are controlled through a Union Type-B30 control panel mounted at one end of the operator's desk in Tower B-17 at Bensenville. As the illustration shows, this panel is of the type used in C.T.C. installations. Its mounting is unique, as it is supported from a vertical piece of 2-in. pipe in such a way that it can be swung through an angle of nearly 180 deg., a feature which facilitates inspection and cleaning, as well as other maintenance work. A flexible conduit carries the control wires from the control panel to a 2½-in. conduit which extends to the sheet-metal relay case. The 18 relays required in Tower B-17 are housed in a sheet-metal cabinet near the control machine in the operating room.

The control panel is completely equipped with a track diagram, track-occupancy indication lights and switch and signal repeater lights. A clockwork time release, mounted on the wall, above the control panel, is used for route releasing and for emergency operation. The control scheme is of the direct-wire type, the 18 wires between Tower B-17 and the central instrument house at Junction B, 2½ miles distant, being carried on an open line; weatherproof copper line wire, strung on porcelain insulators, is used for this purpose. The pole line between these points was rebuilt with Class B poles.

Most of the control equipment at the junction is concentrated in a centrally-located relay house of frame construction with sheet-metal covering, affording fireproof protection. The use of concrete in the floor and foundation eliminates chances for fire to start underneath. The 31 relays in this house were furnished by the Union Switch & Signal Company. Parkway cable is used for runs between the instrument house and the cable terminal boxes at the switch machines; single conductors extend from these boxes to the switch machines, through flexible metal conduit. All insulated wire and cable are of Kerite manufacture.

Senator Couzens Investigates R. F. C. Loans

(*Continued from page 239*)

only the thought of abandoning them," and that he was talking about continuing their place in the financial structure of the country, not merely continuing their operation through receivers. Senator Couzens said he would agree that railroads are essential to the public welfare but that he was wondering if the federal credit should be continued to be used to maintain only one industry and ignore others.

"It would be an untold catastrophe to the public if any considerable number of railroads should be forced into receivership, and something must be done to avert that catastrophe," Mr. Thom said, "but your resolution is directed at the railroads alone, even to those that may still have some security, and it seems to me that when we all hope that conditions will improve there should be at least equal treatment for them with other financial institutions. We think the time is coming when they can repay the loans. If it does not there will be such a disaster that it won't make any difference if anyone pays anyone anything."

Mr. Ballantine told Senator Couzens that to discontinue all railroad loans would be a "tragic mistake" and have a very bad effect on everyone. He said he had a feeling that the railroad situation is very much at the heart of our general financial and business problem and that the preservation of the railroads is an indispensable part of any program of recovery. Conceivably, he said,

the railroads could run without maintaining their debt structure, but because railroad obligations are such a large part of the holdings of fiduciary institutions their situation was in the foreground as a vital element at the very outset of the plan for the creation of the Reconstruction Finance Corporation and if it had not been provided for it would have accentuated other problems.

When Senator Couzens asked if the R. F. C. should loan to a railroad paying dividends, Mr. Ballantine said that such a loan might be an absolutely proper one but that he did not understand any money had been loaned to pay dividends. Mr. Kennedy said that he could not recall any loan to a railroad paying dividends except that the Pennsylvania had recently paid a dividend a long time after receiving a loan.

Commissioner Mahaffie was questioned at some length about the affairs of the Seaboard Air Line. After he said the commission had approved a loan of $1,500,000 to the receivers over his dissent which had not yet been authorized by the R. F. C. Senator Couzens asked Mr. Kennedy why it had not. Mr. Kennedy said it had not yet been presented to the board of directors, "apparently in deference to this committee," and that "we have not been bringing up any railroad loans except those absolutely necessary." Later he gave the following list of other loans recently approved by the I. C. C. and not yet acted on by the corporation: Chicago & North Western, $11,127,700; Meridian & Bigbee River, $600,000; Baltimore & Ohio, $5,000,000; St. Louis Southwestern, $273,000. A loan of approximately $3,000,000 to the Missouri Pacific had been authorized by the corporation on January 31, the day of the first hearing on the Couzens resolution, to enable the company to pay interest due February 1. Commissioner Mahaffie gave a list of some 22 roads whose applications are still pending before the I. C. C., for a total of about $65,000,000, but this includes one application for a loan of $35,000,000 to build a new electric railway between St. Louis and Kansas City for which the commission has not granted a certificate.

In questioning previous witnesses Senator Couzens had been outspoken in his criticism of one or two bond issues with maturities as far off as 1995 or 2020 but when he asked Commissioner Mahaffie about them the latter said there was much to be said in favor of bonds without fixed maturity dates, provided sinking funds are established. Asked why the commission had not required sinking funds he replied that railroads have been a constantly growing institution and that most of the required new capital has had to be financed under existing mortgages. To require the establishing of sinking funds would simply have increased the necessity for borrowing on junior securities. Senator Couzens said that if sinking funds had been required the railroads would not have had so much money to buy competing and strategic lines and asked if hundreds of millions had not been wasted in that way. Commissioner Mahaffie replied that there had been a "great diversion of funds" for such purposes.

Mr. Kennedy testified that he had never attempted to place a fixed dollar value on the collateral required for the railroad loans but had studied the property and its earnings record and prospects and its ability to go on paying interest. He read from a report he had made on the loan to the Central of Georgia before the receivership in which he had expressed the opinion that the corporation would be adequately secured even if a receivership occurred, and said he was still of the same opinion. In several cases where the report showed the market value less than the loan he described it as "merely a shrinkage in the market price" and said that in his judgment the actual value greatly exceeded the amount of the loan. As to the St. Louis-San Francisco, which showed only $829,970 as the market value of collateral for loans amounting to $5,190,000, Mr. Kennedy said that a reorganization plan had been presented for approval before the loan was made which provided for securing the government loans with prior-mortgage bonds, and that if the reorganization legislation is passed there will be a reorganization of the company in short order under which the government would have "fine security." He said that when the first loan was made last June the general situation was very critical and while the loan did not prevent a receivership it had postponed it until a time when the effect was much less than it would have been.

Freight Car Loading

WASHINGTON, D. C.

REVENUE freight car loading in the week ended February 4 amounted to 483,192 cars, an increase of 11,104 cars as compared with the previous week, but 90,731 cars, or over 15 per cent, less than that for the corresponding week of last year. As compared with 1931 it was a decrease of 235,861 cars. The increase over the preceding week was largely in coal loading and there were small decreases in livestock, ore, and miscellaneous freight. The summary, as compiled by the Car Service Division of the American Railway Association, follows:

Revenue Freight Car Loading

Week Ended Saturday, February 4, 1933

Districts	1933	1932	1931
Eastern	115,051	132,479	163,217
Allegheny	91,583	111,928	148,974
Pocahontas	34,172	36,938	42,599
Southern	77,522	88,275	113,154
Northwestern	53,112	66,921	87,101
Central Western	69,130	88,447	104,989
Southwestern	42,622	48,935	59,019
Total Western Districts	164,864	204,303	251,109
Total All Roads	483,192	573,923	719,053
Commodities			
Grain and Grain Products	25,430	31,424	41,453
Live Stock	16,027	20,072	22,797
Coal	106,217	128,630	138,716
Coke	5,567	7,108	9,356
Forest Products	14,284	18,333	36,427
Ore	1,381	1,971	5,506
Mdse. L. C. L.	161,980	187,543	215,439
Miscellaneous	152,306	178,842	249,359
February 4	483,192	573,923	719,053
January 28	472,088	560,343	719,397
January 21	496,434	562,101	715,474
January 14	506,322	572,649	725,212
January 7	435,652	571,678	713,128
Cumulative total, 5 weeks	2,393,688	2,840,694	3,592,264

Car Loading in Canada

Car loadings in Canada for the week ended February 4 totaled 31,911 which was an increase over the previous week's of 474 cars. This, however, was less than the usual seasonal increase and the index number dropped from 56.60 to 55.93.

	Total Cars Loaded	Total Cars Rec'd from Connections
Total for Canada:		
February 4, 1933	31,911	17,119
January 28, 1933	31,437	17,474
January 21, 1933	32,950	17,984
February 6, 1932	40,206	20,710
Cumulative Totals for Canada:		
February 4, 1933	155,706	84,642
February 6, 1932	200,827	100,696
January 31, 1931	222,182	130,133

Horsepower of Modern Locomotives*

A revised method of easily applied coefficients to supplement Cole's ratios in the case of modern locomotives

By A. I. Lipetz

Consulting Engineer, American Locomotive Company, Schenectady, N. Y.

NO one method or formula can express the tractive force of all locomotives. So many variables affect the performance of a steam locomotive that attempts to devise a universal formula have never been successful. The most that can be done by a formula is to express the average results of a well-proportioned locomotive of a design that is characteristic of a certain period of locomotive development, and to give an idea of the power of a steam locomotive under ordinary working conditions with a degree of accuracy sufficient for practical purposes.

With this end in view, the author attempts in what follows to provide means of quickly and fairly accurately evaluating the horsepower and tractive force of a modern two-cylinder, simple-expansion locomotive equipped with a superheater of sufficient size, with or without a feedwater heater, with a proper valve motion, and with other parts characteristic of modern locomotive design.

For locomotives of an earlier period, Cole's formulas are sufficiently accurate, and although the method about to be explained could also be extended to cover all locomotives, no attempt has been made to supersede the Cole method for locomotives of pre-war design.

Direct Methods of Establishing Tractive Force

The object of this paper is to establish a method and figures for the calculation of indicated tractive force as a function of speed.

There are at least two possible direct methods for establishing the tractive-force values for different speeds —one, which might be called the analytical method, and the other, an empirical method.

The first, the analytical method, is logical and seemingly very simple; however, in order to give good results, it requires a number of corrections, which can be determined only from actual experience. It would seem very simple, if the evaporation of the boiler and principal dimensions of the locomotive engine are known, to calculate the amount of steam per stroke for each speed and the tractive force for that speed resulting from the work of the figured amount of steam. The difficulty with the method lies in the fact that two important and very complex factors are neglected: First, the cooling of steam in the cylinder, and second, the distortion of indicator cards due to speed, both of which cause considerable losses.

*Abstract of a paper presented at the annual meeting of the American Society of Mechanical Engineers at New York. Contributed by the Railroad Division.

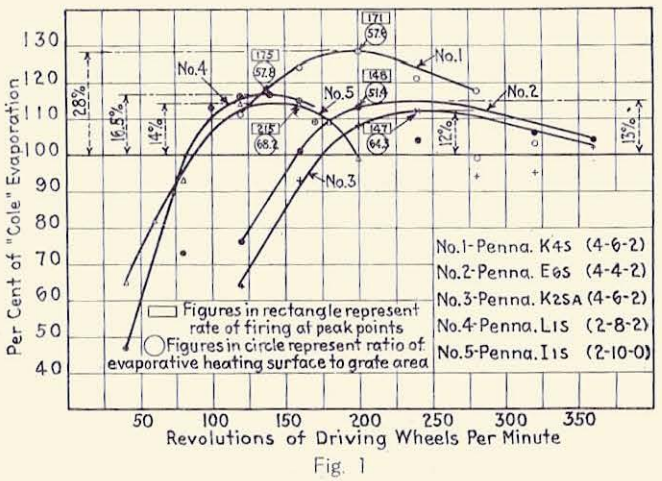


Fig. 1

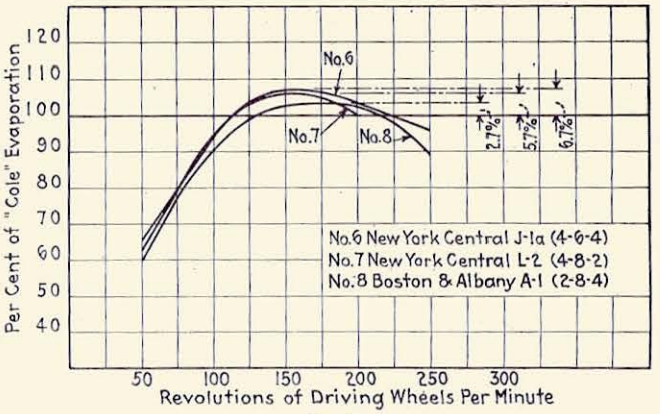


Fig. 2

The advantage of the empirical method, expressed either by tables or formulas, lies in the idea of basing the calculations on horsepower rather than on tractive force, as the former depends upon a smaller number of variables than the latter. If the locomotive is built in accordance with certain standards of perfection and refinement, the horsepower depends mainly upon the amount of steam generated by the boiler. The sizes of cylinders do not come directly into consideration. If they vary within a limited range, as is the case in locomotives, and if the proportions are correct, they should not influence the steam consumption per hp.-hr. As is known from the theory of steam engines, the important factors are the cut-off and the number of revolutions per minute. The first factor determines the expansion ratio and the thermodynamic efficiency of the steam cycle, while the second affects the condensation and steam-friction losses.

Boiler Tractive Force

Thus the tractive-force curve depends in its major part upon the amount of steam generated in the boiler and the consumption of steam per horsepower-hour. The natural thing, therefore, is to establish the laws of the two variables. The analytical method can hardly lead us to the result sought for, and we have to rely entirely upon test figures.

The method of plotting the maximum and average performance curves is clear from Fig. 9. Both horsepower and tractor-force test figures have been used and mutually checked.

It would seem that stationary tests should give the figures of maximum evaporation and speed, because

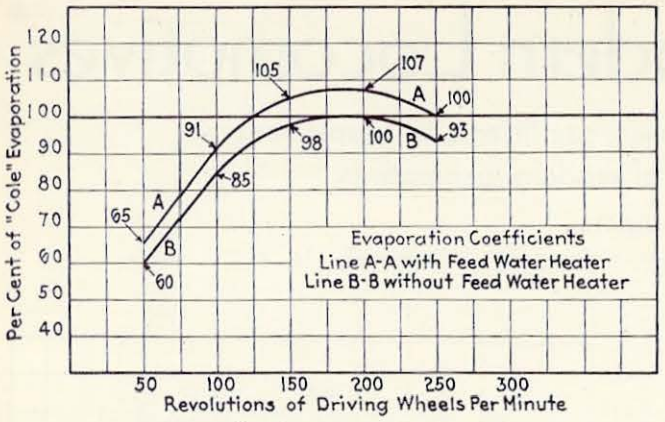


Fig. 3

each test is conducted at constant cut-off and constant speed, and the most severe combination of these two variables should be close to the limit of boiler capacity. With this in view, curves were plotted for five Pennsylvania locomotives (K4s, E6s, K2sa, L1s and I1s), as shown in Fig. 1, for different numbers of revolutions of the driving wheels per minute. The data were taken from bulletins published by the Pennsylvania Railroad on locomotive tests at the Altoona testing plant. For better comparison, evaporation is given not in absolute figures but in percentages of evaporation for respective boilers in accordance with Cole constants (A. L. Co. Hand-Book, 1917, p. 59).

It will be seen that while the curves differ very widely, their shapes all have the same parabolic characteristic of increase with speed up to a certain limit, and subsequent drop for higher speeds. The peak points are from 12 to 28 per cent above the Cole figure. This must have been due to forcing the boilers to high evaporation rates. The peak point on curve 1 (locomotive K4s), for instance, corresponds to a rate of firing of 171 lb. of coal per sq. ft. of grate area per hr. On curve 5 (locomotive I1s) the rate of firing is still higher, due to the small grate area of this locomotive. In Fig. 1 the rates of firing for peak points are inscribed in rectangles. The figures in circles represent the ratios of heating surface to grate area for each of the five locomotives. In other cases they have also been very high, indicating that Cole's evaporation corresponds very closely to a rate of firing of 120 lb. per sq. ft. of grate area per hr., as was assumed by him.

The shape of the curves evidently depends upon the ratios between the principal dimensions of the boilers. It is not possible to find a formula for the curves of evaporation as functions of these variables. They do not run consistently enough, and there are other variables that cannot be put in a formula, as, for instance, the quality of coal. More consistent results were obtained from plotting curves of road tests, as shown in Fig. 2. Three locomotives are considered here (New York Central J-1a and L-2, and Boston & Albany A-1), representing three different classes of service: High-speed passenger, high-speed freight, and moderate-speed freight.

As stated above, there are no test data which would permit plotting these curves directly. An indirect method was therefore evolved for this purpose. From road tests with locomotives the maximum-performance indicated horsepowers and corresponding speeds and cut-offs were chosen. From the Altoona tests, locomotives of similar engine size were selected, and the steam consumption per horsepower was found. It was corrected for difference in boiler pressures and superheats, and further, a certain percentage for auxiliaries was added from road-test data. Thus the probable specific consumption of road locomotives per indicated horsepower at various speeds was established. The product of horsepower and the established specific steam consumption furnished a means of finding the probable steam evaporation of the road locomotive for the maximum-performance power.

It will be seen that in this case the variation of the maximum evaporation of different locomotives is much less; it is between 2.7 and 6.7 per cent greater than the Cole figure. The variation in the location of the peak points in relation to speed is also less, and they all happen to be between 150 and 170 r.p.m. Nevertheless, even in this case it was not possible to tie up the shape of the curves with the principal dimensions of the corresponding locomotives by a mathematical formula.

Other locomotives were also studied, and on the basis of the accumulated information it was found possible to draw a probable curve of evaporation, as shown in Fig. 3. It has a peak point 7 per cent above that of the Cole figure, and at about 200 r.p.m.

All locomotives shown in Fig. 2 were equipped with feedwater heaters, and it is very striking to find that the average maximum evaporation is about 7 per cent above the Cole figure. This is easily explained by the increase in efficiency due to feedwater heating. In other words, we may assume that the Cole evaporation figures still hold good for boilers on modern locomotives without feedwater heaters, but when locomotives are equipped with feedwater heaters, the boilers generate 7 per cent more steam.

It will be seen that the curve was plotted rather conservatively; at low speeds it follows the lowest portions of curves from road tests, while at high speeds it is slightly above the average for road tests—this for the reason that other locomotive data with feedwater heaters pointed in this direction. The plotting of this curve can be done by using the following formula:

$$E = \beta E_o \qquad [71]\dagger$$

where E = boiler evaporation at a certain speed
E_o = Cole evaporation figure
β = evaporation coefficient in relation to the Cole evaporation figure.

The evaporation coefficients are shown in Fig. 3 and repeated in Table I in relation to the crank speed.

It may appear that the average curve was plotted rather arbitrarily, and that another curve could be chosen for the average evaporation with equal justification. It will be seen later that the ultimate recommendations for plotting horsepower and tractive-force curves are based

†Although some of the formulae have been omitted, the author's numbering has been retained.—Editor.

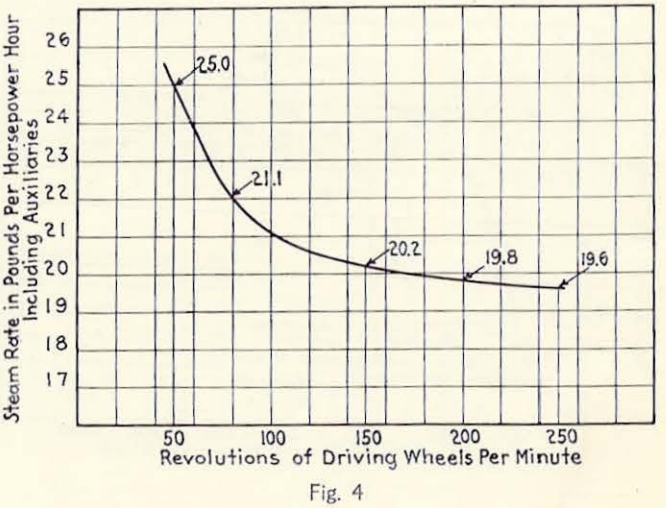


Fig. 4

on test results and do not depend directly on the evaporation coefficients. They are independent of the evaporation curve plotted in Fig. 3, which is given here simply as an illustration of the principle of the method.

Recommended Method

When the boiler evaporation is determined, the indicated boiler horsepower can be found from Formula [6]:

$$P_i = \frac{E(1-x)}{S_h} \quad \ldots\ldots [6]$$

where E = evaporation, lb. per hr.
x = ratio of steam used for auxiliaries
S_h = steam consumption per horsepower-hour, lb. (steam rate)

provided S_h is known.

It was thought more advisable to study $S_h/(1-x)$, which represents S_a, the steam consumption per horsepower-hour, including auxiliaries, rather than S_h and x separately. Various locomotives were analyzed and it

Table I—Evaporation Coefficients

Speed r.p.m.	Evaporation coefficient: Locomotives without feed-water heater	Evaporation coefficient: Locomotives with feed-water heater
50	0.60	0.65
100	0.85	0.91
150	0.98	1.05
200	1.00	1.07
250	0.93	1.00

was found that the average steam consumption per horsepower-hour, including auxiliaries, can be well represented by one of the two curves shown in Figs. 4 and 5, depending upon whether we refer them to the r.p.m. or to the piston speeds.

It can be seen that the two curves differ very little; in other words, the piston speed has actually very little effect on fuel consumption within the limits of strokes in modern locomotives, namely, 28 to 32 in. It is therefore practically of little importance for the computation of boiler horsepower whether the steam rate is taken as a function of crank speed or piston speed, at least for strokes between 28 in. and 32 in.

The method of figuring boiler horsepower can thus be reduced to the following:

On the basis of general boiler dimensions the Cole evaporation E_e is figured and the various evaporations E for different crank speeds n (r.p.m.) are calculated in accordance with Formula [7] and Table I. The figures thus obtained for E are divided over the corresponding steam rates S_a of Fig. 4 and the quotients obtained are horsepowers P_i for the various speeds.

If it is desired to use Fig. 5, which gives steam rates with respect to piston speeds, then it is necessary that

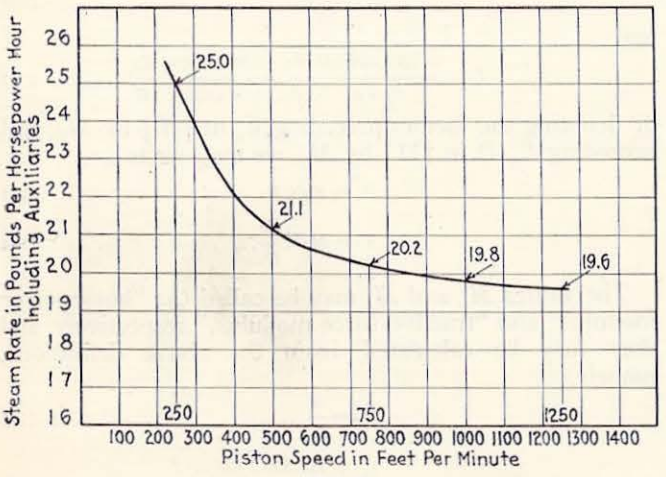


Fig. 5

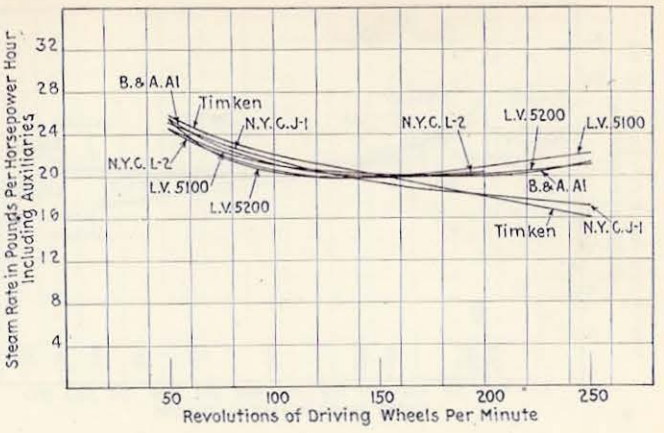


Fig. 6

the evaporation figures estimated in accordance with Formula [7] and Table I be referred to piston speeds, which can be calculated for various crank speeds n by the formula

$$S_p = \frac{s \times n}{6} \quad \ldots\ldots [8]$$

where S_p = piston speed, ft. per min.
s = stroke, in.

In either case, whether the horsepower has been figured in relation to crank speed or piston speed, in order to find the tractive force it is necessary to refer horsepower to locomotive speed, which can be done by using the formula

$$V = \frac{D \times n}{336.134} \quad \ldots\ldots [9]$$

Thus the boiler tractive force is determined and can be plotted on a chart. The rated tractive force is then

Table II

Cole evaporation (E_e)	.....	.....	54,662 lb. per hr.	.....	.....
Revolutions per minute (n)	50	100	150	200	250
Coefficient of evaporation (β)	0.65	0.91	1.05	1.07	1.00
Total evaporation (E)	35,530	49,742	57,395	58,488	54,662
Piston speed, ft. per min.	233	466	700	933	1166
Steam rate, lb. per i.hp.-hr.	25.4	21.3	20.3	19.9	19.7
Boiler horsepower, indicated (P_i)	1398	2335	2827	2939	2774
Speed, m.p.h. (V)	11.75	23.50	35.25	47.00	58.75
Boiler tractive force, indicated, lb.	44,616	37,260	30,074	23,449	17,706

figured, plotted as a straight constant-force line on the same chart, and extended until it intersects the boiler tractive force. The point of intersection determines the speed at maximum tractive force.

Regarding steam-rate curves (Figs. 4 and 5), the following is to be said:

The test data were not sufficient for plotting through the whole range of speed. Only a portion of the curves, representing the most frequent average speeds of road tests, could be plotted. In order to cover the whole range of speed, an inverted method has been used; assuming that the coefficients of evaporation β as above given were correct, the total evaporations of several existing locomotives were calculated as functions of speed and divided over the corresponding horsepowers. The results for various curves are shown on Figs. 6 and 7 in reference to r.p.m. and piston speed. Figs. 4 and 5 represent averages of the curves shown on Figs. 6 and 7.

It will be seen that the steam rates S_a give very consistent results at low speeds up to about 150-180 r.p.m., while above 200 r.p.m. the steam rates vary rather widely. This cannot be due to the coefficient of evaporation β, because this is practically constant between 150 and 250 r.p.m. It is due to the usual discrepancy between locomotive-test results at high speeds, because the influence of such factors as quality of coal, size of nozzle, draft-

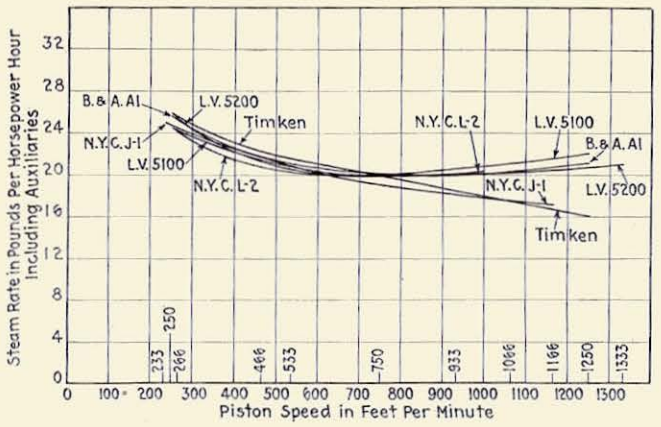


Fig. 7

ing arrangement, steam passages in the cylinders, and valve-motion design become more pronounced at higher speeds.

Suppose that we wish to find the tractive-force curve for a 4-6-4 locomotive with 25-in. by 28-in. cylinders,

Table III

Cole evaporation (E_c)	.....54,662 lb. per hr.....				
Revolutions per minute (n)	50	100	150	200	250
Coefficient of evaporation (β)	0.65	0.91	1.05	1.07	1.00
Total evaporation (E)	35,530	49,742	57,395	58,488	54,662
Steam rate, lb. per hp.-hr. (S_h)	25.0	21.1	20.2	19.8	19.6
Indicated horsepower (P_i)	1421	2357	2841	2954	2788
Speed, m.p.h. (V)	11.75	23.50	35.25	47.00	58.75
Indicated tractive force (T_i)	45,351	37,611	30,223	23,568	17,795

225 lb. per sq. in. working pressure, 79-in. driving wheels, Type E superheater, feedwater heater and a boiler of given dimensions (New York Central J-1a).

We determine first the Cole evaporation E_c in accordance with the A. L. Co. Handbook or calculate the

Table IV

Revolutions per minute (n)	50	100	150	200	250
Modulus M_p* $\times$ 1000	26.00	43.13	51.98	54.04	51.02
Modulus M_t*	65.55	54.36	43.68	34.06	25.72

*These moduli apply to locomotives with feedwater heaters; for locomotives without feedwater heaters they should be reduced by 7/107 = 6.54 per cent.

evaporation by some other means—for instance, assuming an average evaporation of 12.2 lb. per sq. ft. of total evaporation heating surface. If we follow the A. L. Co. figures, we find that $E = 54{,}662$ lb. of steam per hour.

Suppose that we prefer to figure on the basis of steam rate in relation to piston speed rather than r.p.m. In this case draw up Table II on the basis of the curve, Fig. 5. Then plot the boiler tractive-force curve DE (Fig. 8). Calculate the cylinder (starting) tractive

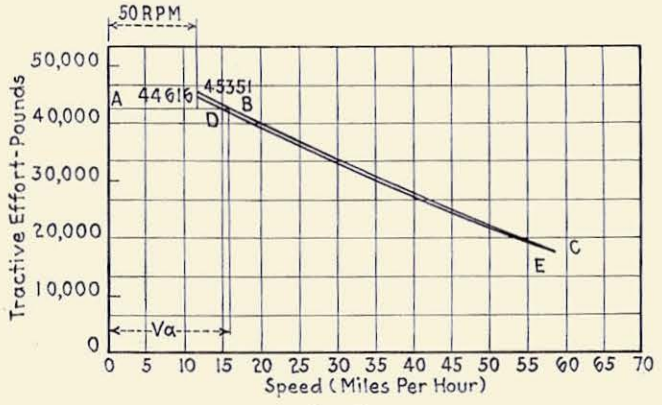


Fig. 8

force and plot a horizontal line AD corresponding to the cylinder tractive force up to its intersection with the boiler tractive force. The line ADE represents the indicated tractive force of the locomotive calculated on the basis of piston speed.

If instead of Fig. 5, Fig. 4 were followed, i.e., with the steam rate referred to crank speed in r.p.m. instead

Table V

Cole evaporation (E_c)	.....54,662 lb. per hr.....				
Revolutions per minute (n)	50	100	150	200	250
M_p	26.00	43.13	51.98	54.04	51.02
$P_i = M_p \times E_c/1000$	1421	2357	2841	2954	2788
M_t	65.55	54.36	43.68	34.06	25.72
$T_i = M_t \times E_c/D$	45,354	37,611	30,222	23,566	17,795

of piston speed, the procedure would be simpler, because no conversion to piston speed would be necessary, as can be seen from Table III.

The results are plotted on Fig. 8 as curve BC, and ABC represents the indicated tractive force of the locomotive calculated on the basis of crank speed. It can be seen that the difference between curves ABC and ADE is very slight.

It can be seen that if the above-described method is carried out on the basis of crank speed in r.p.m. (Table III), the calculation can be simplified by combining vari-

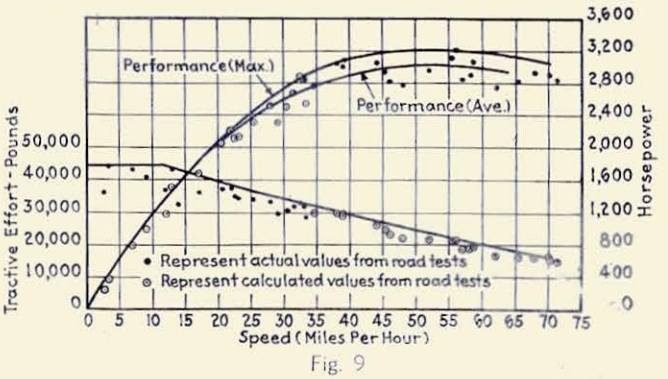


Fig. 9

ous constants into a single one, and obtaining the cated-horsepower and tractive-force figures directly. already have the following relations:

$$P_i = \frac{E(1-x)}{S_h} = \frac{E}{S_a} \quad [6a]$$

$$E = \beta E_e \quad [7]$$

$$T_i = \frac{375 P_i}{V} \quad [5i]$$

$$V = \frac{Dn}{336.134} \quad [9]$$

Consequently

$$P_i = \frac{\beta}{S_a} E_c \quad [10]$$

and

$$T_i = \frac{375\beta \times 336.134}{S_a \times n} \frac{E_c}{D} = \frac{126.050 \times \beta}{S_a \times n} \frac{E_c}{D} \quad [11]$$

or denoting the factors preceding E_c in [10] by M_p, and preceding E_c/D in [11] by M_t, we may write

$$P_i = M_p \times E_c \quad [12]$$

$$T_i = M_t \times \frac{E_c}{D} \quad [13]$$

The values M_p and M_t may be called the "horsepower modulus" and "tractive-force modulus," respectively, and they may be calculated from the above definitions, namely,

$$M_p = \frac{\beta}{S_a} \quad [14]$$

$$M_t = \frac{126.050 \times \beta}{S_a \times n} \quad [15]$$

Coefficient β and the steam rate S_a are functions of the crank speed n; therefore M_p and M_t are also functions of n and may be calculated on the basis of the previously stated values for these variables (Table I and Fig. 4). They are given in Table IV.

Thus the calculation of horsepower and tractive force reduces to the operations indicated in Table V, the results being practically identical with those of Table III.

If the tractive force is the only curve which is desired and the horsepower values are not immediately wanted, the calculation can be still simplified by figuring only T_i and using the modulus M .

There is no doubt in the author's mind that for locomotive horsepower, the boiler evaporation is the controlling factor, at least for the proportions found in existing locomotives. However, if we imagine a boiler of very large proportions, one able to supply more steam than we usually get in the most modern locomotives, longer cut-offs would become possible, and at high speeds the mean effective pressures might drop below those that are obtained at present for corresponding cut-offs, on account of the steam resistances in passages (wire drawing). It is doubtful whether this would happen on locomotives of conventional proportions, but as a safeguard it may be advisable to set a limit for the possible increase in maximum horsepower compared with Cole's cylinder horsepower, which for superheated steam is expressed by 0.0229 times the area of one cylinder in square inches times the boiler pressure in pounds per square inch.[3]

In the author's opinion, that limit could be made not less than 24 per cent for engines with feedwater heaters, but as a conservative figure, 20 per cent should be recommended until further information can be gathered.

For locomotives of older design, with type "A" superheaters, new constants could be worked out similar to those given in the paper, but it is suggested that for these latter locomotives the Cole formula should be used. Until the new method has proved to be practical, the Cole formula should be used for locomotives with Type A superheaters. This should not imply, however, that Type A superheaters can never develop the horsepowers recommended by the new method. Locomotives are known that have given very high performance figures with type "A" superheaters on good coal.

[3] A. L. Co. Handbook 1917, p. 54.

National Transportation Committee Makes Comprehensive Report

Declares railroad system must be preserved but suggests that changed conditions require new policies—Alfred E. Smith files separate statement

THE railroad system must be preserved as the foundation of our system of communication, the most important single element in our social and economic life, the report of the National Transportation ("Coolidge") Committee declares as it introduces the Committee's further findings to the effect that changed conditions require new policies on the part of both the government and railroad managements. The report, which was made public on February 15, is signed by Bernard M. Baruch, vice-chairman of the Committee; Clark Howell and Alexander Legge. Alfred E. Smith, the fourth member, (Chairman Calvin Coolidge's place was not filled following the death of the former President) filed a supplemental report which he prefaced with the following statement: "While I am in substantial agreement with the greater part of the Committee report, this supplementary memorandum states my conclusions in my own language, placing the emphasis where I think it belongs." Special studies of the Committee's research staff will be published later by the Brookings Institution, Washington, D. C.

Recommendations

In general the report is divided into five sections, considering in turn the present transportation set-up, governmental rate-making policies, railroad self-help, extension of regulation to other forms of transport and the present emergency. Recommendations of the Committee declare that: Railroad regulation should be concentrated upon the protection of public interest and should not attempt to "run the business" of transportation; regional consolidations should be hastened, looking eventually to a single national railroad system; unprofitable rail services should be replaced by cheaper alternative transport methods; railroads should be permitted to own and operate other forms of transport, including water lines; inland waterway lines should bear all costs of the facilities provided for navigation and, if the proposed St. Lawrence Waterway fails when tested by this rule of self-support, the pending treaty with Canada should not be ratified; automotive transport should be put under such regulation as is necessary for public protection; the Interstate Commerce Commission should be reorganized; beacons, weather service and similar auxiliaries to air transport should, in the present period of development, be maintained at public expense but every such service should ultimately pay its way; the rate-making rule should say in plain English that the railroads are entitled to make a reasonable profit based upon costs of efficient operation; railroad managements should adopt the competing methods of transport of which they complain and co-operate among themselves to reduce competitive expense; financial management should be improved; transport methods and equipment should be brought up-to-date.

As measures to meet the present emergency the report recommends the facilitation of corporate reorganization by revision of bankruptcy legislation; retroactive repeal of the recapture clause; revision of the rule of rate-making; and an interpretation, in connection with R.F.C.

loans, to the effect that "adequate security" does not necessarily mean "marketable security."

The report opens with its reference to the vital need for the preservation of the railway system but suggests immediately that the way to preserve it is not to abandon regulation but rather to adapt regulation to present conditions.

The Committee's discussion of this proceeds first to a brief consideration of the beginnings of governmental control over railroads which control, it points out, took two forms: First, efforts to foster inter-railroad competition and to create and maintain, by federal financial aid, other forms of competing transport, such as waterways; second, intensive regulatory control of the railroads themselves. "This latter," the report says, "has been practiced long enough and sufficiently extended to prove that it dominates competition or any other influence as the governing law of railroad practice." With this observation, therefore, and with a noting of the fact that "other safeguards have appeared" in the form of new agencies of transport, the Committee calls attention to a new regulatory principle which it states as follows: "Insofar as government policies have been designed, by federal intervention, to create and maintain competition with or among railroads as a defense against monopoly, they should be abandoned as wasteful and unnecessary. Regulation is sufficient."

Government Has Positive Duty to Assure Fair Field

Noting the railroad complaint that "they are shackled by regulation while their competitors are free and unduly advantaged," the Committee observes that "to the extent that this is true, it is unfair" but adds that "it must be equally clear that, notwithstanding the deep public interest in our railroads, the government cannot stand in the way of progress." Thus, when the report finds next that "certain regulation of competitive methods is necessary" and that these non-rail carriers "cannot be permitted to escape their just tax burdens," it continues to the admonition that "regulation of them must arise from its own necessity, and burdens upon them must derive from justice." Hence a second principle is arrived at and stated as follows: "With the danger of railroad monopoly going or gone and (whether going or gone) completely controlled by regulation, government has a positive duty to see to it that neither the railroads nor their competitors are either unduly handicapped or unduly advantaged. Thereafter, in a fair field and no favor, economic competition must decide the question of survival under private ownership and operation."

In closing these general remarks the Committee found itself unable to concur with "respectable opinion that the development of effective competitive methods argues for the abandonment of all railroad regulation." On the contrary it regards regulation as necessary in the interest of both the railroads and the public and thinks that it should be extended to other forms of transportation. But here again is reiterated the suggestion that "care must be taken to maintain managerial initiative."

Consolidation

Turning from its discussion of general principles to more specific recommendations the report comes first to the suggestion that consolidations be hastened with a view to a co-ordinated national railway system.

"The policy of maintaining parallel and competing lines or systems on the theory that thus extortionate rates and discrimination may be restrained is wasteful and, of course, untenable under a system which controls rates and practices to the ultimate," it says. "Consolidation is so vital to the welfare of the public that, unless it is voluntarily accomplished within a reasonable time, the government should compel it. Neither holding companies nor any other device should be permitted to hinder consolidation or to evade the letter or spirit of the railroad law."

Replace Losing Services with Economic Substitutes

In connection with its recommendation that unprofitable railroad services should be replaced by cheaper alternative transport methods, the Committee sees, resting upon regulatory bodies and controlling interests, "something more than a negative duty" to hasten such economic replacements. To the recommendation that railroads should be permitted to own and operate competing services, including water lines, there is added the suggestion that regulation "should be extended to water rates and practices in coastal, inter-coastal and lake shipping to relieve commerce of present chaotic conditions." This, it is explained, does not mean that "water rates based on actual lower costs, should be regulated upward to equalize traffic in favor of railroads." Furthermore, it is also suggested that Congress should promptly clarify its intention on the long-and-short-haul clause of the Transportation act, since "grave consequences affecting wide economic areas are involved."

Inland Waterways Should Pay Their Way

The Committee introduces its general finding that "inland waterways should bear all costs of amortization, interest, maintenance and operation of facilities for their navigation" with the observation that "government assumption of all or any part of the costs of inefficient competing transport is no longer warranted and should be abandoned."

As for the proposed St. Lawrence seaway, only if this can be shown to be the "march of progress" whereby more efficient transportation can be achieved does the Committee think the pending treaty should be ratified.

Motor Transport

The Committee found the problem of the automobile "very difficult," the difficulty being "not solely in the amount of tonnage diverted but resides also in the chaotic rate conditions presented to commerce in general and in many new necessities for public protection." Nevertheless automotive transportation is seen as "an advance in the march of progress;" something which "is here to stay" and in connection with which the Committee, unable to "invent restrictions for the benefit of railroads," can only recommend that government "apply such regulation and assess such taxes as would be necessary if there were no railroads, and let the effect be what it may." While noting the "vast variety of circumstances" on the question of whether public financing of highways operates as a subsidy the Committee refers to its studies which "clearly indicate that in some states automotive vehicles do not bear their full burden of taxes."

"We think," the report continues in this connection, "they should pay the carrying charges and cost of maintenance of the highways and also their share of the general tax load. The Interstate Commerce Commission recommends regulation of interstate buses and extension of their jurisdiction to include interstate trucks. This Committee believes that the situation requires federal jurisdiction of motor transport. It recognizes that no such intricacy of regulation as characterizes railroad supervision can ever be extended to this field, but it is convinced that a broad measure of federal and uniform state control can and should be applied."

Regret is expressed that the Railway Labor Execu-

tives' Association "did not see fit to avail themselves of the Committee's invitation to submit their recommendations on the general subjects of our investigation." It had been the hope of the Committee to secure data "on the best methods of protecting labor in railroads from conditions in competing methods and of improving conditions in the latter field." To its general conclusion on this subject that "Wages and working conditions of labor in transportation are determinable by established procedure in another forum and are not within the scope of this inquiry" the Committee did add that "there should be no heavier burdens on the railroads in employing labor to operate automobiles than on their competitors."

Railway Wages and Working Rules

Also, the report continues at this point: "The Committee believes that a permanent and universal liquidation and downward adjustment of values and incomes of all kinds have occurred in this country and that railroad rates, capital structures, salaries and wages must all respond to this generally changed condition, but none should be sacrificed for the benefit of others. A considerable number of obsolete rules . . . . survive in the railroad wage structure. The Committee does not wish to see labor lose any of its hard-won improvement in conditions, but it believes that the just substance of them can be retained without adherence to obsolete forms, and that labor is as eager as railroads to modernize and simplify the structure of wages and working schedules."

With next its brief comment in favor of present aids to air transport and its declaration that it has no recommendation to make on pipe lines, which latter "are not subsidized" and "are effectively regulated" the Committee enters the second section of the report—that dealing with the rate base.

Rule of Rate-Making

Abandonment of the present rule based on valuation is recommended because: "It tends to ununiformity of results, perpetuation of debt and of obsolete and exaggerated capital structure, insufficiency of allowance for obsolescence and depreciation, inadequacy of surplus and reserves, and maintenance of unnecessary properties and facilities. The results are unjustifiably high rates in some cases and low rates in others. It evolved on the theory that, if not so restricted, the railroad monopoly would earn inordinately. That theory is becoming obsolete."

Thus, the Committee finds, the right principle of rate-making is as follows: "Wherever there is fair economic competition it will decide the rate question and it should be permitted to do so freely. Where there is no such competition, the problem of rate regulation arises, but costs of service under efficient operation are a better general guide than some arbitrary determination of asset values."

Rates Should Contemplate Amortization

Furthermore, the Committee sees no reason to exempt railroads from the "universal rule of financing that any debt for purchase of productive facilities should be amortized during the lives of those facilities out of returns from their use." Thus while it does not believe that "past mistakes as represented by present unwieldy debt structures should be salvaged by increased rates," the Committee does suggest, as to the future, that "rate-making should look to the retirement of new debt incurred for purchase of productive facilities during their lives and out of returns from their use."

The third general division of the report—that dealing with railroad self-help—suggests that "the railroads should do much that they have not done to improve their condition without any government help at all" and that "in view of what could be done by better management, the general outlook seems far from hopeless."

Pointing out that, in the railroad field, as elsewhere, "there has been much liquidation of the general extravagance of the 1929 delusion" the report cites estimates indicating that "a very moderate movement on the upward business spiral would dissipate much of the seeming cloud on the solvency of many railroads." This margin, the Committee, without "proceeding on conjectures of unwarranted optimism," finds to be narrow enough "to invite some robust action in railroad administration to improve earnings statements—not by increased traffic or government intervention—but by economies and improvements in operation, and perhaps by a reduction in rates to attract more business."

While it believes that the argument that railroads have been prevented by regulation from acting freely is too much emphasized the Committee nevertheless sees merit in it and recommends that railroads be subject to no more restrictions than their competitors; "and that Congress and regulatory bodies owe them a positive duty to relieve them promptly of any handicap whatever in this regard."

In connection with its recommendation that railroads should adopt the competing methods of which they complain, the Committee declares that "the railroads have been distinctly remiss in not getting the most out of new methods" and wonders whether "after they have taken this logical step they will be so eager to restrict these other forms of transportation as they are now."

Next it is suggested that the railroads should cooperate to reduce competitive expense by abandoning unnecessary services, consolidating metropolitan terminals and scrapping unnecessary facilities and eliminating circuitous haulage.

Fill Trains by Reduced Rates or Curtail Service

The Committee finds it difficult, in these times, to sympathize with the "extravagance" involved in the spectacle of "crack" passenger trains "shuttling back and forth across the country empty or nearly so." Also, it sees little merit in the argument that such operations are necessary for advertising purposes; it rather thinks that "empty trains should either be filled by reduced rates or taken out of service." In connection with metropolitan terminals, reform is found to be as necessary "to modern metropolitan convenience as to railroad economy."

Furthermore, until the railroads are willing to cooperate to eliminate the "kind of waste" involved in unduly circuitous routing the Committee will find it difficult "to share their apprehension of competing methods." Also, responsibility, in part, for present railway financial conditions is attributed to "the policy of some railroads in applying too great a proportion of earnings to dividends and too little to the retirement of debt and the accumulation of surpluses and reserves."

Methods and Equipment Should Be Up-to-Date

"Transport methods and equipment should be brought up-to-date" is the next recommendation, in which connection the Committee, acknowledging restrictions on railroad initiative and aware, also, of progress that has been made in speed and quality of service, nevertheless

thinks that "it cannot be fairly said that railroad advance in applied science is abreast of that in other industrial fields." While it found it impracticable to to make exhaustive studies on this subject the Committee does recommend that the I.C.C. authorize, and the railroads set up, "one or more central research and engineering organizations to which all railroads in certain groups shall contribute—their products to be available to all contributors."

Reorganization of I. C. C.

The report's fourth general section discusses the extension of regulation to other forms of transport and finds that "The existing regulatory mechanism of the Interstate Commerce Commission is inadequate and should be improved by reorganization without expansion or increased expense." It continues with a discussion of the legislative, judicial, and administrative functions of the I.C.C., which require the Commission to act as a body on so many questions that the set-up is rendered "inconsistent with any modern theory of operation except for legislative and judicial action of the very highest order." Mindful of this preoccupation of the I.C.C., the Committee is concerned because, at the same time. it sees before itself data indicating that "the necessity for planning and for comprehensive information on the whole transport problem is absolute." A lack of "incentive or authority in the Commission to plan and to act affirmatively" is detected in citations given from the regulatory body's latest annual report—a report "which is eloquent of a somewhat passive attitude toward acknowledged evils and also of grave difficulties that have arisen from drastic regulation verging on administration by an authority which sits and hears but has only a limited scope in which to inquire and plan and act."

Thus, the Committee recommends that the I.C.C. "should have inquisitorial powers and duties to keep constantly abreast of changing developments and should be required to report annually to Congress on the state of the nation's whole transport system with its recommendations for betterment.

"Its activities should be reorganized with appropriate separate departments, with a chief at the head of each, for its legislative, executive and judicial functions, and for each major special function such as control of corporate reorganization. It should have also a planning department with a research staff and such other departments as experience indicates. Except in the exercise of its more important legislative and judicial functions, departmental hearings and decisions should be sufficient and action as a body should not be required. While all heads of departments should sit in council on basic policies and important problems, the body should have a vote only on the most important legislative and judicial decisions. Either one man, or at most an executive committee of three, should have exclusive responsibility and authority in all executive functions, and final decision in all but the more important legislative and judicial functions of the separate departments."

Comment on Emergency Recommendations

The report closes with brief discussions of the four recommendations designed to meet the present emergency. Revision of bankruptcy procedure is recommended "to permit prompt and realistic reorganization of overcapitalized corporate structures without destructive receiverships and judicial sales on depressed markets to the end that the railroads' justifiable borrowing requirements may be met with safety to the lender under adequate protection." The recapture clause, the retroactive repeal of which is recommended, is declared to have been based on an "economic misconception." Comment here on the proposed revision of the rate-making rule refers back to the second general division of the report which considers the subject in detail. On the fourth emergency recommendation, that relating to R.F.C. loans, the Committee's comment suggests that "if, upon reorganization of overcapitalized structures or on sound existing structures, a particular loan is sufficiently protected by priority of lien and reasonable prospects of earnings available to its priority of payment, we do not regard marketable collateral as a determining factor. In fact, we believe that, with prompt improvement of capital structures where necessary, private capital will be available for necessitous railroad loans."

Supplemental Report of Alfred E. Smith

In his "Supplemental Report" Mr. Smith recommends as emergency measures, the retroactive repeal of the recapture clause and "a debtor relief act with a special provision governing railroads, which will have for its object scaling down debts and composing differences without bankruptcy receiverships." The operation of such an act Mr. Smith would limit to the period of the emergency, and he suggests an expiration date of January 1, 1935. The former New York Governor finds himself unable to join his colleagues in recommending, as an emergency measure, a revision of the rate-making rule; nor can he see that any "useful purpose will be served at this time by an extension of the powers of the Reconstruction Finance Corporation with regard to railroads so that they can make additional loans without full collateral, upon the assumption that railroad rates will be adjusted in such a way that these loans are bound to be repaid."

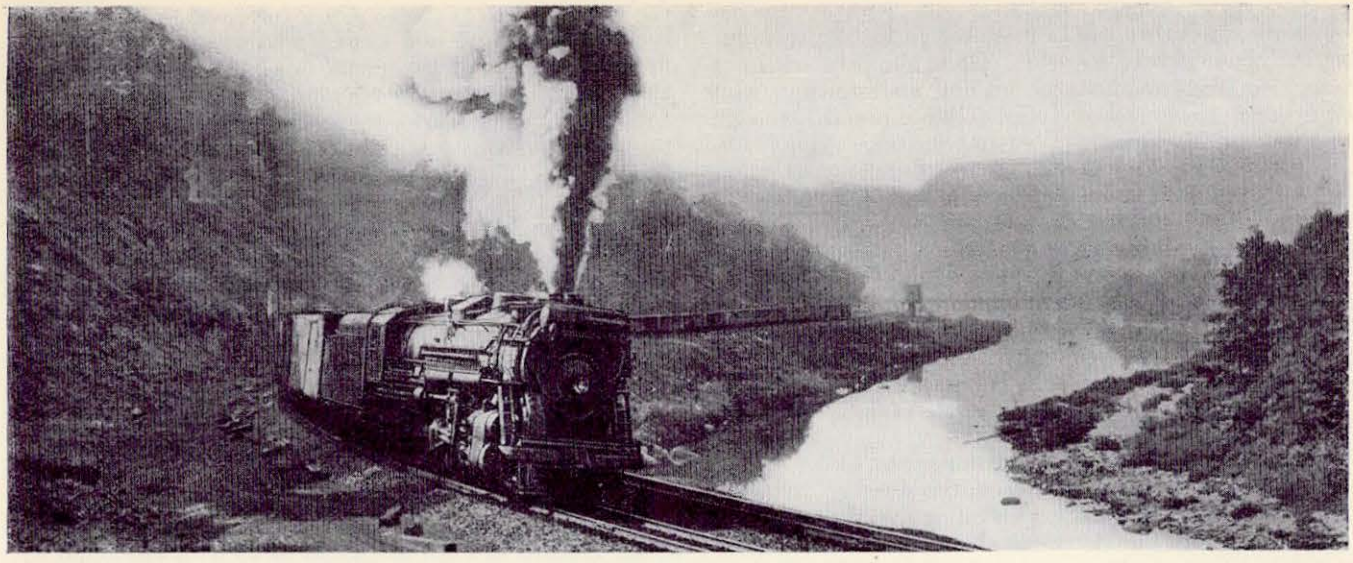
Mr. Smith believes further that the effect of competition on the railroads "has been exaggerated" and that "drastic regulation of competing services is not the solution of the railroad problem, and such regulation should be established only in the general public interest."

Thus, Mr. Smith suggests that air lines and pipe lines be left as they are. As to water transport he believes that "government subsidies in this field should be curtailed, not primarily because they result in unfair competition with the railroads, but because these subsidies have not proved effective."

Mr. Smith opposes as "a waste of public funds" the construction of the St. Lawrence Waterway. "Present rail facilities," he adds, "are more than adequate to provide for anything which the proposed canal can accomplish." He thinks that "a special investigation should be conducted into the Inland Waterways Corporation to discover exactly what it costs the War Department to operate this corporation, and whether or not further expenditures for this purpose should cease."

As to highway competition, Mr. Smith says that testimony before the Committee "does not indicate to me that the competition is at this time as serious a menace to the railroads as they claim it to be." He cited the small number of interstate highway carriers but next stated that "it is unquestionable that this form of transportation will be used more and more because it is economical and efficient." He thinks that trucks and buses are already substantially taxed and that these taxes "are being steadily raised so that within a short time, in the course of normal events, the users of the highways for commercial purposes will be paying their full share of the cost of construction, reconstruction and maintenance." While conceding that there is much to be said

(*Continued on page 255*)



Cooperative Studies of Locomotive Operation Have Contributed Greatly to Increased Train Loading

How the Railways Have Increased Their Efficiency by Co-operation

American Railway Association co-ordinates progress of individual carriers with benefit to all

MORE transportation is being offered shippers by the railroads of the United States for a given cost than by the railroads of any other country in the world as a result of efficiency in operation brought about through development and research in the many phases of railroading, including engineering and equipment design, train operation, accounting, freight handling, etc.

The results are evident in many directions, typical of which may be cited the reduction in freight unit expenses from $0.0107 per revenue ton-mile in 1920 to $0.0077 in 1930, or from $4,423,511,247 in 1920 to $2,970,583,962 in 1930, a reduction of $1,452,927,285. Other examples are the reduction in expenditures on account of injuries to persons from $56,237,000 in 1920 to $29,314,000 in 1931, the substantial decrease in casualties to employees and passengers; the reduction of almost $100,000,000 in freight claim payments during the period from 1920 to 1931, inclusive; the elimination of car shortages; and the saving of $702,215,000 since 1920 by reason of the lesser quantity of fuel used per unit of service performed.

A. R. A. Big Factor

These accomplishments have been due, in no small measure, to the American Railway Association and its co-ordination and dissemination of ideas developed on individual railways. When the roads were taken over by the government during the war, recognition was given to the necessity for the American Railway Association and it was made a part of the United States Railroad Administration. During this period, to eliminate duplication of effort and to co-ordinate all of the activities of the railroads in one central organization looking toward improvement in all phases of operation and maintenance, the scope of the association was enlarged until, at the present time, it includes the following divisions:

I—Operating.
II—Transportation.
III—Traffic.
IV—Engineering.
V—Mechanical.
VI—Purchases and Stores.
VII—Freight Claim.
VIII—Motor Transport.
Car Service Division.
Bureau of Explosives.
Freight Container Bureau.
Committee on Automatic Train Control.
Joint Committee on Grade Crossing Protection.

Car Shortages Stopped

Probably the most important achievement of the railways, from the standpoint of the public, has been the elimination of car shortages. As recently as 1922, doubt was expressed whether any possible effort of the railroads could prevent the re-occurrence of car shortages. Yet, the railroads have not experienced a car shortage since that year, although the traffic handled has increased markedly. In fact, it has been estimated that, with the present efficient movement of cars by the railroads and with the continued co-operation on the part of shippers, the traffic of the country can be handled with 250,000 less cars, not including refrigerator cars, than were owned by the railroads in 1922 when car ownership was the highest of record.

To bring about this result the Car Service division organized 13 regional advisory boards, the membership of which includes both shippers and railroad representatives. Each of these boards meets every three months to study the transportation situation and determine the

number of cars that will be required in its territory during the coming three months. These shippers' organizations also study methods of loading and stowing, while some have also created freight claim prevention committees for the purpose of eliminating claims filed against the railroads. A more recent development among the regional advisory boards has been the inauguration of a plan whereby the boards will serve as a clearing house for ideas regarding containers and distribution practices of shippers. Most important of all, these boards have been the means of developing a high degree of co-operative effort in solving the transportation needs of the country.

Reduction of Claims Saves Millions

Another outstanding accomplishment of direct interest to the shipping public has been the average reduction since 1920 of $8,660,700 each year in freight claim payments. In reducing these freight claim payments from $119,833,127 in 1920 to $24,565,360 in 1931, attention has been directed to the elimination of rough handling of cars, defective equipment, delays, improper refrigeration, all of which cause damage. This effort has been directed by the Freight Claim division and while most of its work is confined to the railroads, since it involves those measures over which they have direct control, a considerable portion of its activities extend into other fields. This division has worked with shippers to improve their methods of loading and stowing so that shipments will arrive at destination without damage. It has also solved many difficult transportation problems as, for instance, on a western railroad which was forced to accept large pieces of finished stone from a quarry for movement to a nearby city which, although protected by all known types of loading and bracing, continued to arrive at destination broken and the railroad had to pay large claims. The claim department of this road studied the situation to determine the cause and then equipped the cars with a snubbing type spring which eliminated the breakage.

The Freight Claim division was established in 1919 to assume and carry on the activities of the Freight Claim Association, which had been established in 1892 as a consolidation of three territorial associations. The objects of the division are to standardize and harmonize, nationally and on a uniform basis, rules and practices of carriers governing the prompt and lawful settlement of freight claims with claimants and between carriers; also to study claim causes and the application of preventive measures. The work and methods of procedure are facilitated and standardized through the following plan of organization: Committee of Freight Claim Prevention, American Railway Association; 10 territorial organizations known as Freight Claim Conferences; prevention committees on individual railroads; joint railroad committees at terminal points; prevention committees in other organizations of shippers and receivers; and special joint or individual committees studying specialized problems. Experiments have also been fostered to develop methods to insure the safe transportation of special classes of commodities.

Improvement in railroad operation is reflected also in the robbery payments of the Class I railroads, which decreased from $12,000,000 in 1920 to $970,072 in 1931. This has been brought about through closer co-operation between the railway police departments, sponsored by the Protective section which was organized in 1920. These railway police departments have established records for apprehension and conviction surpassing those of many cities. This section, through its regional committees, has established cordial and closer relations with state and municipal police departments, and through its efforts, also, several of the larger manufacturers have arranged for identification marks on their shipments, which tend to prevent losses.

Safety Section Work Guards Employees and Passengers

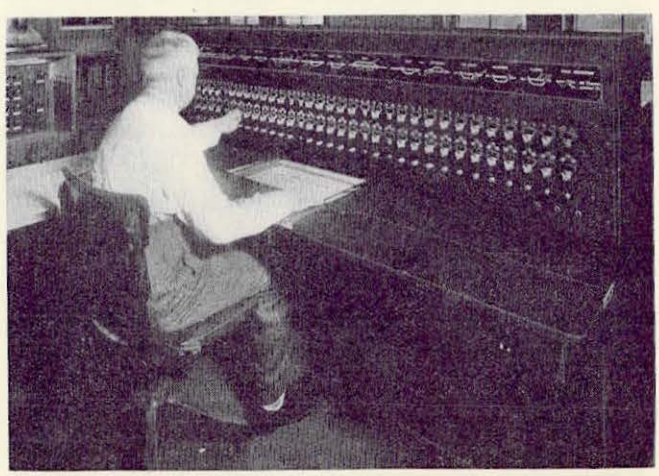
One of the most far-reaching developments which the association has directed has been the perfection of safety measures as regards employees, passengers and the public. This achievement has resulted in a saving in life and, consequently, in a reduction of expense because of suits. By guarding the safety of employees, the railroads have also increased employee efficiency and have reduced the time lost because of accidents. The elimination and protection of grade crossings have likewise benefited the public and the railroads.

The degree of safety improvement is best demonstrated by the fact that the total casualties to employees decreased from 150,012 in 1923 to 22,038 in 1931, a reduction of 85.3 per cent. Furthermore, in 1931 only 685 employees were killed and 21,353 injured, as compared with 2,056 killed and 147,956 injured in 1923. This record is further emphasized by the performance of individual roads, among which the Pacific Lines of the Southern Pacific operated 207 consecutive days, a total of more than 64,000,000 man-hours, during the period from October 9, 1930, to May 5, 1931, without an employee fatality.

In 1931 only 4 passengers were killed in train accidents on all roads in the country, as compared with an average of 77 for the five-year period beginning with 1922. Also, the number of passengers injured in train and train service accidents dropped from 5,584 in 1921 to 2,104 in 1931, while in the latter year only 493 passengers were injured in train accidents.

Grade Crossing Accidents Reduced

Grade crossing accidents also have shown marked improvement. In 1931 the number of persons killed at grade crossings totaled 1,811 and the number injured 4,657, as compared with 2,568 killed and 6,666 injured as recently as 1928. This record is further magnified by the fact that automobile registrations increased appreciably during this period, and the further fact that accidents on highways, elsewhere than at grade crossings, increased steadily. This record has been brought about by the organization of safety departments which in turn have engaged in intensive educational campaigns among employees and the public to eliminate accidents. The installation of safety devices in shops and along the right-



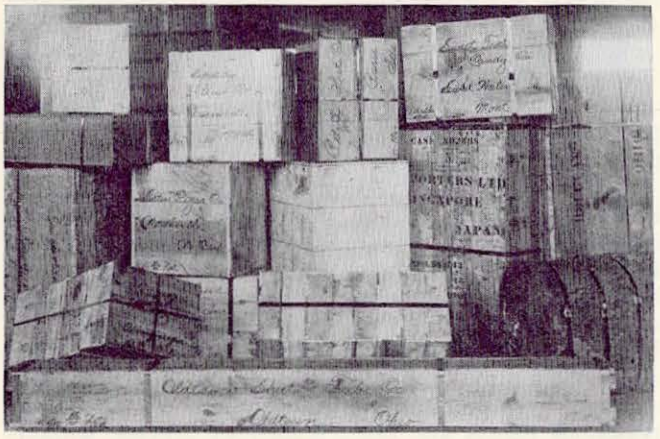
Centralized Traffic Control Has Increased Track Capacity and Facilitated Train Movements

of-way, as well as the introduction of safer operating practices, are also important factors.

Many Technical Problems Solved

The development of transportation would not have been possible without improvements in the technical branches of railroading. This applies particularly to engineering, wherein the standardization of practices has been of the utmost importance. Leadership in this field has been taken by the American Railway Engineering Association, which was organized in March, 1899, and which has functioned also since 1919 as the Engineering division of the American Railway Association. In the course of its 33 years of useful activity, it has studied every conceivable phase of applied science affecting the construction and maintenance of railway tracks, bridges, buildings, terminals, water supply and fuel service facilities. Not only has this resulted in the development of improved designs and practices, but it has been the means of disseminating these practices among the railways.

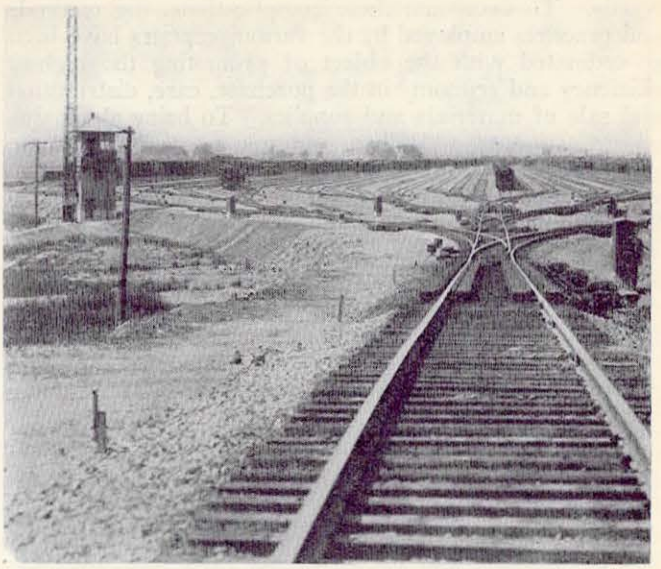
It has also done invaluable work in effecting a high degree of standardization. Its specifications covering crossties, concrete, steel bridges, building construction and many other phases of its field are widely used in their entirety or as the foundation for specifications



The Development of Adequate Containers, Proper Marking and Strapping Are a Few of the Practices Which Have Been Fostered by the Freight Claim Division of the A. R. A. to Reduce Damage to Lading

drafted by the individual roads. Its work on plans for track tools, frogs, switches and other track work has not only resulted in improved practices but also in a considerable measure of standardization. Its investigations in water service have had an important influence, particularly in bringing to the attention of the managements the opportunity for improving the quality of boiler water. Its work is summarized in a Manual of Recommended Practice for Railway Engineering developed during the past 31 years, which comprises some 1,531 pages and deals with more than 350 subjects pertaining to roadway, crossings, ballast, ties, track, buildings, etc.

The solving of mechanical problems has also been vital to the developing of a large transportation machine. The most important of the mechanical improvements include the uniformity and interchangeability of car parts between railroads; draft-gear specifications and the development of the design for a standard steel sheathed wood-lined box car. These developments have not only effected economies in the construction and maintenance of cars but have been instrumental in perfecting a reliable transportation service. In 1924 a code of rules for the maintenance of air brake and signal equipment on locomotives and cars was formulated, while through the



The Car Retarder Has Increased the Efficiency of Classification Yard Operation

activities of various committees and their investigations and studies more than 280 recommended practices have been adopted.

These developments have been brought about largely through the Mechanical division, which was organized in 1919 to take over the activities of the Master Car Builders' Association and the American Railway Master Mechanics' Association. The method employed has been the exchange of information concerning the construction, maintenance and service of motive power and rolling stock and the parts thereof, investigations through committees and discussions in conventions.

Communication and Signaling Improvements

Among other technical developments are improvements in communication. The perfection of the telegraph and telephone systems on the railroads has been brought about through the Telegraph and Telephone section which has developed some 49 standards and 168 specifications which are included in its Manual of Recommended Practices.

Signaling designed to keep trains moving and to increase the capacity of existing tracks constitutes another important development, the credit for which belongs to the Signal section. This section has done much to develop and improve automatic block signals and interlockings, and has published a Manual of Recommended Practices, containing specifications on 114 subjects and instructions on 16 subjects, in addition to 289 detail drawings and designs of standard mechanical and electrical appliances.

Another important technical development has been the installation of automatic train control and continuous cab signals which have not only made possible safer and faster operation of trains but have produced other operating and economic advantages. At the present time the railroads have installed automatic train stop or train control devices or continuous cab signals on 11,885 miles of road, 22,273 miles of track, 9,706 locomotives and 620 rail motor cars. This work has been dealt with by the Committee on Automatic Train Control which was organized in 1920 for the purpose of co-operating with the Interstate Commerce Commission in working out practical plans for the installation of this equipment.

Purchasing Now a Science

The major changes that have taken place in railroad operation have intensified the problems of purchasing ma-

terials. To overcome these complications, the methods and practices employed by the various carriers have been co-ordinated with the object of promoting the highest efficiency and economy in the purchase, care, distribution and sale of materials and supplies. To bring about this co-ordination, the Railway Storekeepers' Association, now the Purchases and Stores division of the A. R. A., was organized in 1904. The activities of this division have had a far-reaching effect, providing better methods for the control of stock investment and greater efficiency and economy. It has developed a fundamental plan of organization for materials and supplies and has recommended procedure and standards for its various activities.

Medical Activities Beneficial to Employees and Public

Many developments in railroading are apparent, but others do not manifest themselves to the public. Among these are the medical activities of the railroads which have contributed to railroad efficiency by so improving the health of employees as to reduce the amount of time lost by sickness and by increasing their individual efficiency by keeping them well. The medical departments of the railroads have also been public benefactors, as is shown by one railroad whose medical department, during its existence, has uncovered seven epidemics of infantile paralysis by following up cases sent in to it from distant points. This organization was also the first to recognize sleeping sickness in its area and had diagnosed four or five cases before its presence was generally known. It also discovered cases of tularemia, a rabbit and squirrel disease, and instituted measures for stopping its spread before the disease was recognized as a serious menace to the state.

The work of the medical departments has been directed by the Medical and Surgical section of the A. R. A. which, through its various committees, has standardized practices and disseminated medical and surgical information among the members. The section is in close touch with the United States Public Health Service and the several state boards of health in connection with revisions of the United States quarantine regulations and the various requirements of the state health boards affecting the operation of railroads.

Motor Transport Affords Economies

The application of motor transport to both passenger and freight service has been another effective means whereby the railroads have been able to bring about economies. This has been particularly true in the use of motor coaches to supplant unprofitable trains on branch lines and as a means of meeting highway competition. In addition, the railways have been able to extend their services to additional territories by employing motor coaches as feeders. The utilization of trucks is also making possible the development of storedoor pick-up and delivery which has been a factor in procuring and holding traffic.

Where in 1926 the motor coaches operated by steam railways were numbered in the dozens, they are now numbered in the thousands and the same applies to a considerable extent to the number of motor trucks. At the end of 1931, the number of railways operating motor coaches had increased to 81, while the number of motor coaches they were operating, either directly, through subsidiary companies, or through companies in which they held a substantial stock interest, had attained a total of 5,000. Motor trucks, tractors, and trailers were used in freight service by approximately 85 railroads during 1931 and the number of pieces of equipment employed is estimated at 10,000.

This expansion of motor transport in the railway field has been facilitated by the Motor Transport division which has acted as a clearing house for ideas. It has also directed the study of problems raised by highway competition to develop methods for meeting this form of competition and to guide individual carriers in handling their local problems. The work of the division has been handled by three sections, one devoted to the application of the motor coach by the steam railroads, another to the application of the motor truck and a third to the application of the rail motor car.

Other Improvements Benefiting Shippers

Still another decided improvement in railroad service which has been a benefit to the railroads and the shippers has been the simplification and standardization of the conditions and terms upon which traffic is submitted for transportation by shippers. By standardizing the demurrage rates, the railroads have not only fixed the charge for holding cars by shippers and consignees but have created a condition wherein the majority of cars are released within 48 hr. and, therefore, are available more promptly for other shipments. The adoption of rules governing reconsignment has likewise reduced the time that cars are in transit and has also released cars for additional shipments. Likewise, by bringing about uniformity in the use and interchange of equipment and standardizing rules governing car service, per diem, switching, reclaim, embargo and storage, the carriers have greatly facilitated transportation and effected economies in the use of cars. The standardization of such transportation subjects has been brought about through the Transportation division.

Another branch of transportation in which the railroads have been particularly active in a collective way is in the formulation of practices for the hauling of gasoline, explosives and other dangerous articles, which, because of their nature, can cause loss of life and destruction of property. Last year the railroads of the United States transported 42,608,816 tons of gasoline and 243,741 tons of explosives in addition to large quantities of acids, compressed gases, corrosive and poisonous liquids and other dangerous articles, without the loss of a single life and with the smallest property damage for any year since 1915. This remarkable record was largely due to studies made by the Bureau of Explosives and its supervision over such shipments. In addition, it has prepared specifications for the construction of tank cars to provide for the safe transportation of these commodities.

Summary

Such, in brief, are the more important indices of progress in the perfection of transportation practices on the American railways, a progress that has been greater during the last ten years than in any two similar decades of the past. It is no coincidence that this period has also been that of greatest activity of the American Railway Association. The first is, in large measure, a result of the second. The A. R. A. has not only greatly hastened the universal adoption of beneficial practices developed on individual roads but it has also stimulated initiative on these roads and, equally important, has provided the organization for specialized attack on one unsatisfactory practice after another. It is through united action of this character that many of the improvements in practices have been brought about since 1920—improvements that have expedited and otherwise improved the service to the public and at the same time reduced its cost.

National Transportation Committee Makes Report

(Continued from page 250)

for regulation of all common carriers on highways by the I. C. C. or some other federal agency, Mr. Smith cites difficulties of reaching individual owner-operators and suggests that highway carrier regulation should for the present "be for the purpose of insuring responsibility, and fixing physical standards for vehicles and for similar purposes, rather than for the fixing of rates."

Continuing to his discussion of grade crossings Mr. Smith thinks that in some states the railroads' share of such costs is unduly burdensome. He has not been able to give valuation sufficient study but from his "superficial study" he is not entirely satisfied that the prudent investment theory is unworkable. The reproduction cost theory he calls "obviously obsolete."

Smith Would Abolish I. C. C.

While implying "no criticism of its members" who have "attempted to function under an obsolete and unworkable law," Mr. Smith nevertheless finds "little in recent history to justify the continuance of the Interstate Commerce Commission as now organized." If, as as he says, more powers of the board must be delegated, Mr. Smith raises the question as to "why a board is needed at all." He, therefore, favors the abolition of the I. C. C. and "the creation in its place of a new department of transportation headed by one man, or a one-man bureau head in the Department of Commerce, determining policies with the approval of the Secretary of Commerce." As Mr. Smith sees it "what we need is a new transportation system, not endless hearings on a system that does not work."

His comment on the work of the present commission is the expression of his belief that "too much emphasis has been placed on the judicial functions, especially on valuation and rate making, and too little on planning and administration."

"The complete break-down of the present valuation formula," he continues, "has left the Commission in a condition which would be laughable if it were not so serious. The scrapping of the present formula opens up some very interesting questions for taxpayers. What, for instance, becomes of the tons of statistics and other data collected on the basis of the old formula? What of the payroll army of federal commissioners, counsel, experts and clerks? What of the wasted time of local officials, railroad representatives, farmers, business men and commercial organizations? Suppose that just a little common sense had been substituted for all this scientific hash, this maze of regulation and red tape?"

In conclusion, Mr. Smith expresses his conviction that "the fundamental problem of the railroads is that of nation-wide consolidation and reorganization to reduce costs and rates, and to write off losses . . . The question for the railroad executives, directors and security holders to decide is whether the steps taken in this direction should be compulsory or voluntary . . . Those who are responsible for present railway management need not complain of radical or drastic governmental action in the near future if they are unwilling even to attempt to meet their problems in a bold, forthright way through their own initiative and co-operation. They have an unrivalled opportunity to do themselves and the country a great service. They should have the guidance and help of the national and state governments in this effort."

Odds and Ends . . .

Odd Occupation

As an odd occupation, we offer the life-work of B. C. Banks of Kansas. Mr. Banks is the official muskrat trapper on Lake Barton for the Missouri Pacific. It seems that the muskrats burrow into and weaken the dams, which is a matter of real concern to the railroad. Banks is enjoying good hunting these days, getting from four to seven muskrats daily.

A Story with a Moral

How often have we heard some railroad man remark, "There's only just so much traffic, and the best we can do is to get our share." Yet, more than 20 persons in a certain Oklahoma community, who had planned to make trips by bus or in their own automobiles, were persuaded by a Katy section foreman to use our railroad. Doesn't the performance of this one man smash to smithereens the "just so much traffic" argument?—From the M-K-T Employees' Magazine.

Safety Record

Apparently, they believe thoroughly in "safety first" on the Kansas City Southern. According to reports from the mechanical department at Texarkana, Ark., it has been more than six years since a reportable personal injury occurred there. Incidentally, Texarkana yard engines have accumulated 237,923 miles of service since the last engine failure there which occurred on August 1, 1927.

Man of Many Parts

They say that while William H. Woodin, president of the American Car & Foundry Company, was participating in extended conferences with President-elect Roosevelt in Washington recently, violins and cellos of the Manhattan Symphony Orchestra were practicing his new score, "The Covered Wagon." Mr. Woodin's latest musical contribution was played by the orchestra in New York on January 29. Not content with being a leading industrialist nd a director in many corporations, Mr. Woodin devotes such time as he can to music. This time has been spent to good effect, his musical scores having won him a high place in the ranks of American composers.

Jig-Saw Puzzles Now Railway Equipment

No longer need passengers on trains of the Chicago, Milwaukee, St. Paul & Pacific between Chicago and Seattle, Wash., sit with folded hands as they proceed on their transcontinental journey. The thoughtful management of the railroad, quick to recognize the country's currently favorite pastime, is providing boxes of jig-saw puzzles in its library-lounge cars so that passengers can spend their time staring at brightly colored and grotesquely shaped bits of wood instead of looking out of the windows at the plains and mountains. The particular puzzles which the Milwaukee has put on its trains, when properly assembled, depict an artist's conception of "A Century of Progress," Chicago's World Fair of 1933.

The First Head-On Collision

Thanks to the courtesy of W. G. Besler, chairman of the board of the Central of New Jersey, who passed along a letter he received from Ivan Nicholson, furloughed employee of the Canadian National at Montreal, Que., we are privileged to repeat the story of the first head-on collision between steam locomotives which occurred in this country. Mr. Nicholson ran across the story while reading up on railroad history. It seems that the first head-on collision occurred on the Camden & Amboy, now part of the Pennsylvania, in 1836. In a thick fog, a train of lumber collided with a passenger train, producing what a newspaper of the day described as a "tremendous crash." Apparently, they did not run trains quite as fast in those days as they do now, since no one was seriously injured. The enginemen and firemen jumped off in time and the passengers went through the experience with only a few bruises here and there.

Communications . . .

A Sliding Scale for Passenger Fares

NEW YORK.

TO THE EDITOR:

It is a foregone conclusion that passenger fares have to be lowered. Almost everyone is in agreement on that, but few offer definite suggestions further than that fares in coaches should be reduced to 2 cents or 2½ cents per mile, keeping the rates for Pullman passengers the same as at present (3.6 cents per mile), although abolishing the surcharge.

I think two sets of rates-per-mile would be a mistake. For one thing, that would constitute an inflexible arrangement. If a passenger who held a coach ticket from New York to Chicago, wanted to ride in a berth overnight (probably at the Pullman conductor's suggestion) he could not. The Pullman Company would lose; so would the railroad.

Reducing the basic coach fare so drastically would probably appeal to present bus riders, but, after all, private automobile travel has affected railroad passenger revenue more than the buses have. I offer a scheme to reduce the basic fare that permits passengers to transfer from coach to Pullman; that concedes something to those who, wanting Pullman comforts, cannot afford the best Pullman offers; that protects to some extent the revenue now being derived from remunerative traffic; that should appeal to private automobile owners: Make the basic rate 3 cents for the first 100 miles, 2½ for the next 400, 2 cents for distances beyond. Zone the country approximately to correspond to present passenger association territories, the rate-per-mile to begin again at 3 cents for those crossing the zone boundaries, to protect certain terminal expenses and the revenues of some roads (particularly those whose revenues are derived largely from seasonal traffic).

Retain the surcharge, but raise it to 100 instead of 50 per cent of the Pullman rate. Maintain present Pullman fares, but lower the upper berth fare to one-half that of the lower berth fare. I realize this latter has been tried before, but never generally enough to prove its value. Probably some clever engineer could design a car that would hold more automobiles than any we now have, hence carry them more economically. Run automobile cars on the rear (for rapid loading and unloading) of present secondary passenger-express trains. Charge a minimum of five tickets for transporting an automobile (four for passengers, one for car; free plus a handling charge for parties of five or more on one ticket).

Many families drive their own cars to their summer or winter homes, not because they like the long drive, but because they need the car at their destination and cannot afford to ship it at the present rates. Each car driven from New York to Florida costs the railroads from two to four tickets. The present plan (two tickets extra for the car) is too high to compete between those points where steamship lines run; the service, in freight trains, is too slow to be attractive. Another class of travelers, touring in their automobiles, might be prevailed on to pack car and occupants in a train overnight instead of stopping at a hotel. A certain railroad, for instance, might feature such overnight service between Harrisburg and Fort Wayne.

I believe that such a rate structure would provide reasonable prices for coach travel; would protect present revenue between such points as New York and Philadelphia, where terminal costs are high; would offer a new intermediate class (upper berth traffic); would protect to some extent the revenue from Pullman riders.

All of this would depend upon proper advertising. The railroads will have to get together to tell their story to the public. And it is an interesting story they have to tell, not merely that the X. Y. & Z. is the best road from *A* to *B*. Talk about the new rates, how much it costs to travel by automobile; give the story of the locomotive, tell them how to pick out the various types; feature the humble Pullman porter; tell them what a passenger representative can do in planning trips for them.

Institutional advertising will remind the large class of people who never ride on a train of the fact that trains still run. The younger generation hardly realizes it can go places, see things, on railroad trains.

But, as an anti-climax, I confess I feel that no panacea will cure that sick member of the railroad family—passenger business—so surely as money in the public's pocket once again. Anything we do will have to be in the nature of an experiment, with large stakes to win or lose. My aim in making these suggestions is not to foist my ideas on anyone, but merely to create discussion. Should discussion beget ideas, ideas will aid the patient's recovery, and that is my main concern.

A SUBSCRIBER.

The Railroad Situation—Cause and Cure

PORT HURON, MICH.

TO THE EDITOR:

What is wrong with the railroads? This question is often asked of the average railroad officer, and the usual reply is that the unregulated truck and bus and the loss in business due to the depression have almost put the railroads out of business.

Prior to the war the railroads were rapidly approaching the same financial condition that they are in today. The United States Railroad Administration was formed, however, and it carried them through the critical period of the war. After return to private control, practically every road taken over by the administration set up statements and statistics showing that its properties were returned in a depleted condition. Settlements were made which, in most cases, were very satisfactory to the railroads. The boom times following the war, easy money, and the demand for better transportation caused the railroads to enlarge their staffs (particularly in the freight traffic department) and expand their terminal facilities, not only to meet present demands but to provide for a continuous future increase.

The wisdom of this expansion is now questionable. Many millions of dollars have been spent on facilities which will be obsolete before they are used. The over-zealous competition of the freight traffic departments has brought forth a deplorable condition. They are cutting each other's throats and hindering the free movement of traffic in their efforts to solicit traffic from each other.

The railroad operates on a schedule of rates based upon what the traffic will bear, rather than upon the cost of handling. The present tariffs are so complicated that only an expert can interpret them. As a result, the shipper (if he can afford it) is compelled to maintain a staff of experts to check and recheck his rates to prevent overcharges. The railroads maintain similar departments to prevent undercharges.

The truck is in business for the money it can make, and fixes rates based on the cost of transportation. As a result, the railroad is fast losing the so-called high-class traffic. Trucking companies extend credit. Perhaps they may lose a few dollars occasionally by doing so, but it gives them the edge on the railroads, which would not trust their grandmothers. Credit is essential in all lines of business. The average merchant is pleased to extend credit to good customers because he knows it encourages trade.

If it were possible to destroy all of the existing rules, regulations, operating agreements and tariffs, the railroad would very rapidly come into its own as the most economical transportation system, for the reason that the new rules, regulations, etc., would conform to present-day conditions. Freight rates would be based principally on the cost of handling, with an additional amount charged for insurance against loss or damage, if desired by the shipper. The passenger rates would be surprisingly low, as it is volume that produces the revenue. The present Interstate Commerce Commission supervision of practically every move made by the railroads would be discontinued. The railroads would join hands under the rule of a Czar, who would direct their policies to meet existing competition and give satisfactory service to the public.

WILLIAM N. BOYD.

NEWS

Sale-in-Transit Rates on Livestock Challenged

Hearings were opened at Chicago on February 13 following recent sessions at Denver

A hearing on sale-in-transit rates on livestock was opened at Chicago on February 13 before Examiner William A. Disque of the Interstate Commerce Commission, the parties being the St. Louis Livestock Exchange vs. the Alton, and the St. Joseph Stock Yards Company vs. the Alton & Southern. The hearing at Chicago follows one held in Denver, Colo., three weeks ago. At the Denver hearing, Rocky Mountain livestock raisers interpreted the application filed by Missouri River markets as an attempt to eliminate sale-in-transit rates in the Rocky Mountain territory, while the Missouri River interests contended they are trying to restore the rates for their own markets. Western interests hold that the way in which the complaints have been filed puts the river markets in the technical position of saying they will be satisfied with the abolition of transit in the West as a solution if undue preference is proved.

At the opening of the Chicago hearing, 11 interests were involved in the case, including a number of western and middle western cities, cattle producers, stock yards and railroads. The case deals with the right of producers to sell their livestock in transit, in which case they secure the benefit of through freight rates, while actually making use of intermediate haul rates which are proportionately higher. Three cities, chiefly Denver, but including Salt Lake City and Ogden, have the privilege of moving their livestock eastward on the through-rate basis. Livestock shipments from these points have been allowed to be stopped at yards enroute to try for sales. The stock yards of St. Joseph, Sioux City, Iowa, Kansas City, Mo., and Omaha, Neb., are alleging that rate discrimination is being made in favor of Denver. They are asking that either they be given rate parity with Denver or else the present system be discontinued. The packers complain that they have to pay the regular rates to Denver and packing centers on the Missouri river, where their slaughtering is done, after which they must pay a higher rate on the finished meat product to eastern consuming centers. Eastern buyers, on the other hand, are able to buy their livestock in the West, move it on the through rate, taking advantage of sale-in-transit privileges, do the slaughtering in the East and have their products at the consuming centers without having to pay the higher rates on finished meat.

The packing interests contend that if the sale in transit privilege is extended to Omaha, Kansas City and other points seeking it, it will be possible for eastern packing houses to move 100 lb. of live cattle for 85 cents, while it would cost their western competitors $1.13 to move their finished products to the eastern markets. Western packers, therefore, are asking that they be allowed to move their finished products on a sale-in-transit basis.

Sub-Committee Favors St. Lawrence Treaty

The sub-committee of the Senate foreign relations committee that held hearings on the treaty providing for the proposed St. Lawrence river seaway voted, 5 to 2, on February 10 to recommend to the full committee a favorable report on the treaty. Senators Glenn, of Illinois, and Wagner, of New York, voted against the recommendation.

Pullman Car Bedrooms Cheaper

The New York Central announces that in the private bedroom cars which are run on a number of the more important trains of that road, the charge henceforth when the room is occupied by one person, will be one adult railroad fare plus the charge for an upper and a lower berth. This brings this charge down to a little more than the cost of a section.

Special Pullman Inauguration Rate

For the first time in history persons going to the inauguration ceremonies at Washington on March 4 will be able to buy round-trip Pullman accommodations at a reduction of 25 per cent. The Pullman Company also will continue to give low rates for special excursions and all-expense tours. The Pullman policy this year on special excursions will also be to establish a 25 cent charge over the one-way charge for the round trip on short-haul week-end offerings.

Associated Traffic Clubs' Meeting June 6-7

The Associated Traffic Clubs of America will hold their semi-annual meeting in Peoria, Ill., on June 6-7. The meeting would ordinarily have been held the latter part of April or early in May, but it was felt that the meeting should be held at a time immediately subsequent to the opening of the Century of Progress Exposition in Chicago so that members can take advantage of reduced railroad fares to the convention and the exposition.

Canadian Senators Debate Railway Bill

Sharp disagreement on compulsory features of Duff report—Hot fight foreseen in House

With the two principal Canadian railways and the organized employees fighting hard against a provision for compulsory co-operation and economies on the part of the roads, in the proposed legislation giving effect to the Royal Commission's recommendations on the railway situation, the final test of the strength of public ownership in what is regarded as a preponderantly private-ownership Canadian Senate will come this week when a vote will be taken in the Committee on Railways, Telegraphs and Harbors on this clause. While Senator Arthur Meighen, government (i. e., administration) leader in the upper house and pilot of this legislation, told the committee a few days ago that adoption of the principle of the bill did not necessarily mean that the compulsory feature must be retained he gave his fellow members last week a plain warning that the government regarded it as essential to the eff tiveness of the measure, so that even though many Conservative senators may be strongly disposed toward supporting the Canadian Pacific demand for amalgamation of the railways under private control they will probably have to swallow their predisposition and vote for the government plan.

Another effort was made last week by the railways to show that the compulsory feature (part 3 of the Duff report) calling for the establishment of an arbitral tribunal to virtually enforce economies on the roads, was needless. Grant Hall, vice-president of the Canadian Pacific and S. W. Fairweather, director of the bureau of economics of the Canadian National, appeared before the committee to show how many savings had already been effected through voluntary co-operation and mutual economies without compulsion. Since the depression hit the roads in 1929 operating expenses of the C. N. R. had been cut by $100,000,000, according to Mr. Fairweather.

Within a week it is expected the bill will have been disposed of by the Senate and sent over to the House of Commons. There a real fight will be staged but not primarily on the bill itself. Both the Liberals and Conservatives there are committed to the measure but the Liberals will lash out against the administration and renew their charges of partisan persecution of the C. N. R. management, in-

(*Continued on page 259*)

Railroad Reorganization Legislation Postponed

Like many transport bills of the past, it has now been sidetracked by Congress

Legislation designed to pave the way for insolvent railroads to effect a reorganization and scale down their capitalization or fixed charges has encountered the same fate as other transportation legislation which has been before Congress for years intended to improve the railroad situation before the stage of insolvency was reached. In other words it has been postponed to the next session of Congress, along with numerous other troublesome problems.

The Senate judiciary committee, at a meeting on February 13, voted to report favorably that part of the Hastings bankruptcy bill which provides a substitute for bankruptcy procedure for individuals, but to postpone consideration of those sections of the bill dealing with reorganization of corporations generally, and of railroads. The bill under consideration, which had been in charge of a sub-committee, was a revision of the Sumners bill passed by the House on January 30, and of the corresponding bill which had been introduced by Senator Hastings. As chairman of the sub-committee Senator Hastings had prepared a redraft of the bills, including several modifications in the railroad section, in the light of suggestions made by the Interstate Commerce Commission, representatives of the railroads and securityholders, and Prof. A. A. Berle, one of President-elect Roosevelt's advisors.

Members of the committee said that there was general agreement that legislation for railroad and corporate reorganization is needed but that the Senators found the subject rather complicated, particularly as they had not had any hearings on the railroad section, and they feared that inclusion of the provisions dealing with corporations might endanger passage of the provisions for individuals and farmers. Senator Hastings, in reporting the bill, said that the committee did not have an opportunity to consider the corporate reorganization section and the railroad section sufficiently to enable the Senate to pass upon those questions at this time. Senator Couzens remarked that "that would indicate that we ought to suspend the lending of money to the railroads, if that is to be the recommendation of the committee."

Western Commissioner to Rule on Two More Disputes

The question as to whether a certain western railroad should add luxury equipment on certain trains and thus virtually force other roads to adopt similar facilities has been referred to Harry G. Taylor, commissioner of the western railroads, and *ipso facto* chairman of the Western Association of Railway Executives. While this is the first question of this nature to be referred to the commissioner since his appointment, (December 15) it is only one of the problems he has already been called upon to deal with. One of the most important has been that of developing a schedule of freight rates on certain commodities, to meet motor truck competition, which will be mutually agreeable to all carriers. Another problem is the study of free transportation, with a view to standardizing the issuance of passes, particularly to shippers connected with industrial railroads or short lines having a length of only one or two miles.

Two Cents a Mile in Tennessee

The Nashville, Chattanooga & St. Louis on February 6 established a two-cent basic rate and a one and one-half cent coach rate between Memphis, Tenn., and Nashville for a period of six months as an experiment to ascertain if the public can be induced to ride on the trains instead of in private cars and motor coaches. Also, the Pullman sleeping car rate of $3.75 has been cut to $3, while seats in parlor cars have been reduced from $1.50 to $1. This railroad tried an experimental rate two years ago, but for only a period of three months.

Mechanical Division Will Not Meet in June

As an economy measure, the annual meeting of the American Railway Association, Mechanical Division, usually held in June, will be omitted this year, according to a recent decision of the General Committee. It is expected that the General Committee will meet with all committee and sub-committee chairmen some day during the last week in June to consider mimeographed copies of the reports and take appropriate action regarding the submission of necessary details to letter ballot.

Intercoastal Regulation Bill Reported

The House committee on merchant marine has favorably reported S 4491, the bill which proposes to establish a degree of regulation of intercoastal steamship traffic by the Shipping Board, with some amendments from the form in which it was passed by the Senate last year. The bill provides for the publication of tariffs which must be adhered to but omits the provision of the Senate bill under which the board would have been given power to prescribe minimum rates on complaint. Another amendment makes the definition of common carrier cover contract carriers.

Railway Employment Again Reduced

A further reduction of 19,673 in the number of employees in the service of Class I railways took place between the middle of November and the middle of December, according to the Interstate Commerce Commission's monthly compilation, bringing the total down to 993,542. This was less than the number recorded last August, 996,317, the first time in this century when the number fell below the million mark. There was then an increase to 1,010,440 in September, and 1,033,225 in October, followed by a reduction in November to 1,013,215. The number in December was 12.38 per cent less than the number in the corresponding month of the year before.

John J. Bernet Is Again Nickel Plate President

Will remain as president also of the Chesapeake & Ohio and the Pere Marquette

John J. Bernet, president of the Chesapeake & Ohio and the Pere Marquette, was elected also president of a third Van Sweringen property, the New York, Chicago & St. Louis (the Nickel Plate) at a meeting of the board of directors of the latter road on February 8. Mr. Bernet succeeds Walter L. Ross, who has resigned from the presidency because of ill-health, but will continue to serve the Nickel Plate as a director and a member of the executive committee; and has also been retained in an advisory capacity with the title of president retired.

Mr. Bernet is now head of three of the larger units making up the Chesapeake & Ohio-Nickel Plate system of the eastern

John J. Bernet

four-party consolidation plan. In assuming the presidency of the Nickel Plate he returns to the position in which he first demonstrated his ability to transform weak railroads into profitable concerns. Following their acquisition of the Nickel Plate in 1916, the Van Sweringen brothers, in casting about for someone to operate the line, picked Mr. Bernet for the job. His outstanding success in placing the company on an efficient and profitable basis won him further responsible positions in the Van Sweringen group. In 1927, he left the Nickel Plate to become president of the Erie and two years later he was transferred to the Chesapeake & Ohio and the Pere Marquette to effect a consolidation of the managements of those two properties.

Mr. Bernet was born on February 9, 1868, at Brant, Erie county, N. Y., and entered railway service in 1889 as a telegraph operator on the Lake Shore & Michigan Southern (now part of the New York Central). During the next 22 years

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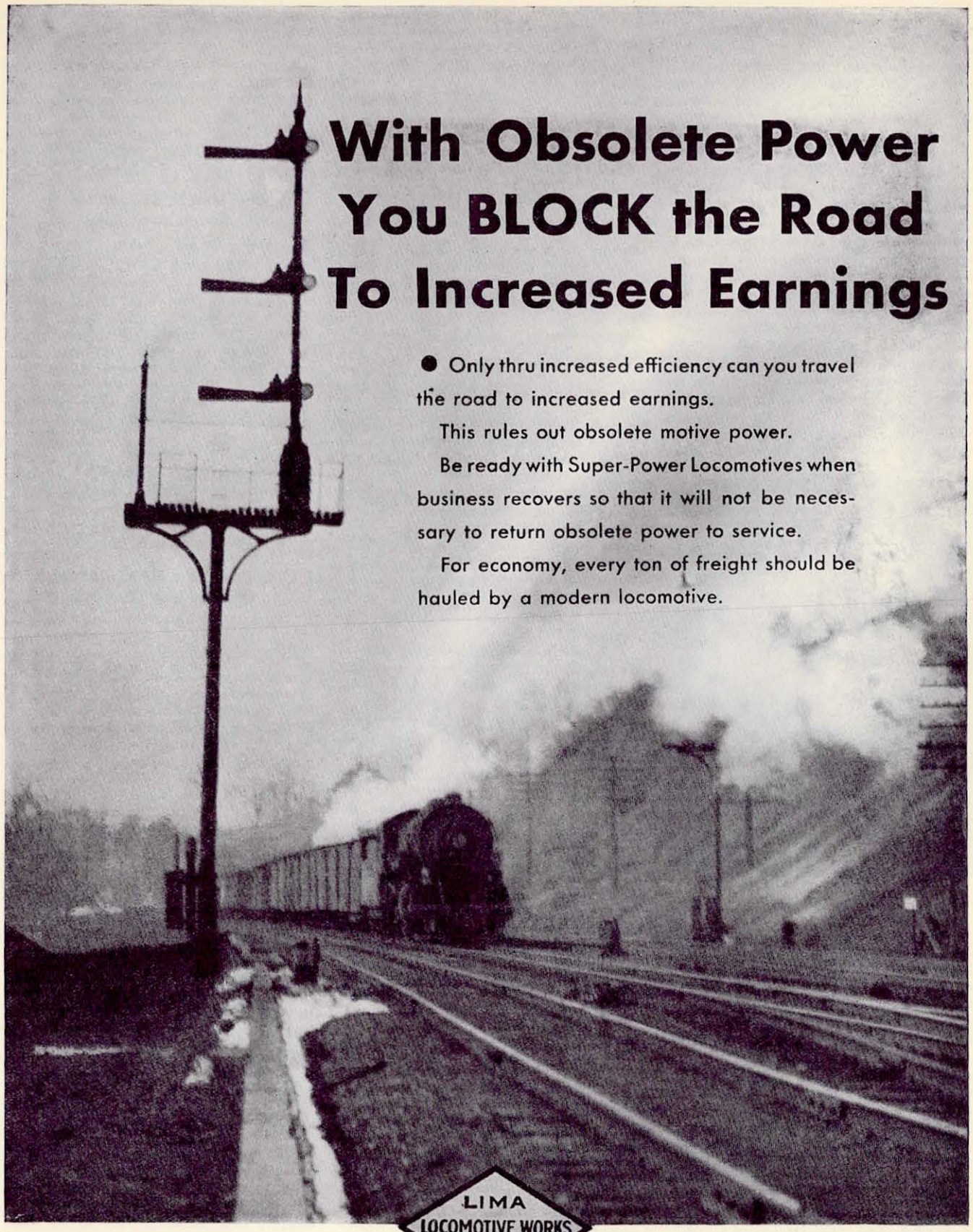

With Obsolete Power You BLOCK the Road To Increased Earnings

● Only thru increased efficiency can you travel the road to increased earnings.

This rules out obsolete motive power.

Be ready with Super-Power Locomotives when business recovers so that it will not be necessary to return obsolete power to service.

For economy, every ton of freight should be hauled by a modern locomotive.

LIMA LOCOMOTIVE WORKS INCORPORATED

LIMA LOCOMOTIVE WORKS, Incorporated

LIMA • OHIO

he served successively in the positions of train dispatcher, trainmaster, assistant superintendent, superintendent, assistant general superintendent and general superintendent. On January 1, 1911, Mr. Bernet left the L. S. & M. S., to become assistant to the vice-president of the New York Central's lines west of Buffalo, with headquarters at Chicago, and on April 15, 1912, his title was changed to assistant vice-president. When the New York Central & Hudson River and the Lake Shore & Michigan Southern were consolidated into the New York Central on January 1, 1915, he was chosen vice-president at Chicago. Mr. Bernet became president and general manager of the Nickel Plate on July 15, 1916, and served as its federal manager from October 28, 1918, to March 1, 1920. On the latter date he again assumed the title of president, being subsequently transferred to the Erie and thence to the Chesapeake & Ohio and the Pere Marquette.

Mr. Ross had been president of the Nickel Plate since he succeeded Mr. Bernet to that position in 1926. He was born on

Walter L. Ross

January 1, 1865, at Bloomington, Ill., and was educated in the public schools of Bloomington. After serving as a messenger boy, operator and clerk for the Western Union Telegraph Company, he entered railway service in 1887, as an office boy on the Wabash, after which he was consecutively operator, chief clerk and cashier in the local office, clerk in the trainmaster's and dispatcher's offices and local agent on the Wabash and the Indiana, Illinois & Iowa (now part of the N. Y. C.), general agent on the I. I. & I. and division freight and passenger agent on the same road. On June 1, 1904, he became general passenger agent on the Toledo, St. Louis & Western and also general freight agent on April 1, 1905. On December 1, 1907, Mr. Ross was appointed general traffic manager of the T. St. L. & W. and the Chicago & Alton (now the Alton) at Chicago, and from 1909 to September 1, 1912, he was vice-president in charge of traffic. From 1910 to 1911 he served also as vice-president of the Iowa Central and the Minneapolis & St. Louis, and on September 1, 1912, he was elected president of the T. St. L. & W. Mr. Ross served as receiver of the latter road from October, 1914, to January 1, 1923, when it became a part of the Nickel Plate. Thereafter he served as senior vice-president of the Nickel Plate until his election as president in 1926.

Canadian Senators Debate Railway Bill

(*Continued from page 257*)

cluding Sir Henry Thornton, the road's former president, under the guise of a war on extravagance. Premier Bennett's inevitable come-back will be that his most drastic action was justified because of the hopeless financial position into which the road had been thrown.

The Senate committee rejected an amendment proposed by Hon. James Murdock naming the Dominion Railway Board to settle disputes between the railways instead of an arbitral tribunal as proposed by the Duff Commission. Senator Meighen said the committee had arrived at "the crux of the bill" and that if the arbitral tribunal feature is dropped the mountain will have labored and brought forth a very small mouse, since all that will have been accomplished will be the displacement of the present board of directors of the C. N. R., by a board of three (one provision of the Duff report upon which agreement has been reached).

"The Railway Commission is not an arbitral tribunal; the Railway Commission is a court," said Senator Meighen. He was not particularly encouraged by the statements of Messrs. Hall and Fairweather as to the progress already made by the railways in achieving economies, and he felt it was going to be a long road to travel to get to a concrete goal. If there were no tribunal, in his opinion, the company which had the least to gain by joint economy measures would "stall," whereas if it knew the other company could bring it before a tribunal it would be more likely to come to terms.

Senator George Lynch-Staunton (Hamilton, Ont.) expressed the fear that "the two railways are sunk anyway, and I don't want the C. P. R. to be able to say the Government destroyed them. I don't want to enable them to go before their shareholders and say we forced them to scrap 6,000 miles of line."

Senator Charles P. Beaubien, of Montreal, feared the effect on international money markets of the creation of an arbitral tribunal to enforce economies on the C. P. R. He thought it would be wise "to hold our hands this session."

Hon. J. H. King discussed in the Senate the problems of highway competition with the railways, with special reference to the second part of the report of the Royal Commission. His resolution read:

"That in the opinion of the Senate the Government of Canada should bring into conference the provincial governments, the executives of the Canadian National and Canadian Pacific and representatives of the newer forms of transportation, with a view to formulating regulations for them of an interprovincial or national character which would permit of their normal and proper development and prevent unfair and unwarranted competition with our railway systems."

Senator Meighen said the question of the regulation of motor transportation and its relation to railway transport was of vital importance. He cited the example of the street railways. They were an indispensable necessity and the city authorities took steps to protect them.

Nine Merchants Indicted for Fraudulent Claims

Nine commission merchants and a traffic agency were indicted by a federal grand jury at Chicago on February 9 on charges of defrauding the Wabash of approximately $1,000,000 through false freight claims. The indictments are the result of an investigation by the Interstate Commerce Commission on complaints by shippers, while the grand jury inquiry was directed by the State's attorney. The largest amount alleged is that against one company which, from January, 1930, to September, 1932, filed 700 claims totaling $184,000 and obtained $99,000. Another company in one year filed claims for $140,000 and obtained $100,000; while a third, from March to August, filed claims totaling $150,000 and received $140,000.

I. C. C. Examiners Find Switching Rates At Chicago Not Discriminatory

In a proposed report on an investigation of the relation of interstate and intrastate rates for switching in the Chicago district, Examiners H. C. Faul and W. B. Wilbur, of the Interstate Commerce Commission, have recommended to the Commission a finding that the maintenance of intrastate rates and carload minimum weights on a lower basis than the corresponding rates and minimum weights, found not unreasonable and approved for interstate transportation, has not been shown to result in unjust discrimination against interstate commerce. They say the record does not indicate that an increase in the intrastate rates to the level of the interstate rates would result in increased revenue to the carriers.

New York-Boston Time Changes

The New York, New Haven & Hartford beginning February 20, will reschedule its Yankee Clipper, now leaving New York for Boston at 4 p. m. and Boston for New York at 3.30 p. m., to leave in both directions at 1 p. m. The train will make the through run, as at present, in four hours, 45 minutes. With this change the Knickerbocker Limited, now starting each way at one o'clock, is discontinued. The Merchants' Limited, leaving each terminus at 5 p. m., will also be run through each way in four hours, 45 minutes. The extra fare on the Yankee Clipper, now $2.50, is reduced to $1.20 which is the charge on the Merchants' Limited. The Yankee Clipper will henceforth run every day, except Sunday; and the Merchants' Limited daily, except Saturday, the same as at present.

Beatty Urges Unification

Foreshadowing some sort of partnership arrangement between the people of

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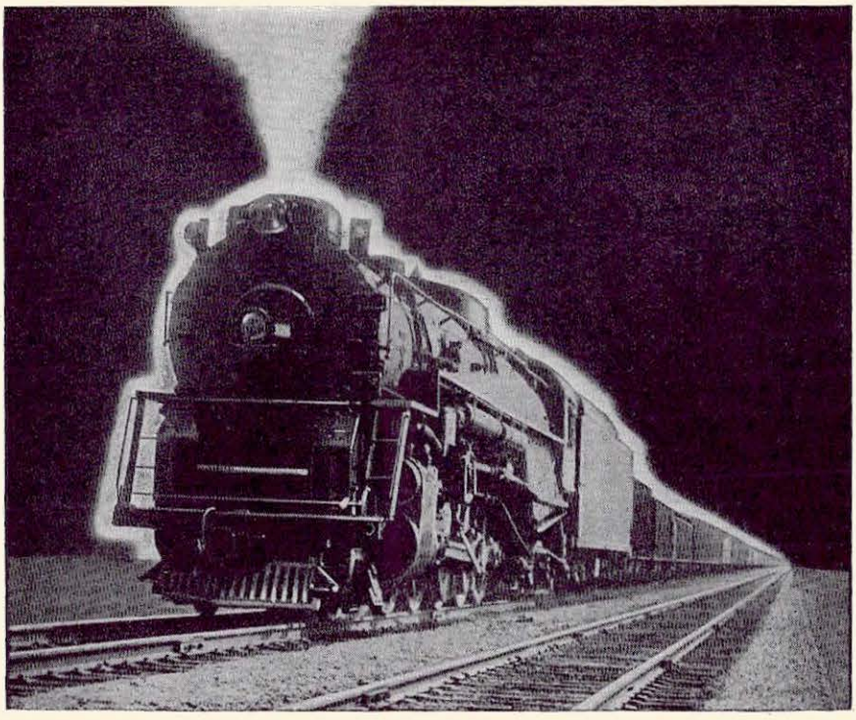
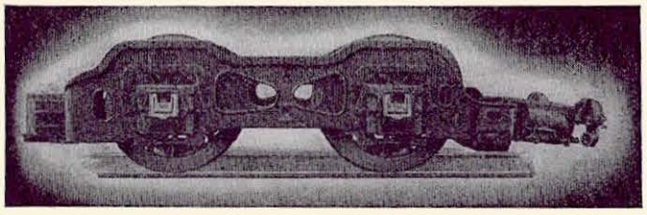


EVEN THE BIGGEST Need The LOCOMOTIVE BOOSTER

In these days of lowered traffic the Chesapeake & Ohio has an enviable record of maintaining its net. « Typical of the vision that has guided its operation was its replacement of Mallets with modern 2-10-4 Super-Power locomotives equipped with The Locomotive Booster. « Although the world's largest two cylinder locomotives at the time they were built, they incorporated The Locomotive Booster as a fundamental part of the design. « The 2-10-4 type locomotives have equal starting power to the Mallets but have 8% more sustained power at 30 M. P. H., coupled with ability to make a continuous run over the division without reducing tonnage. « On any locomotive, large or small, The Locomotive Booster will improve operation and reduce costs.

THE FRANKLIN SLEEVE JOINT
An improved flexible joint that gives long service with little attention.



FRANKLIN RAILWAY SUPPLY COMPANY, INC.

NEW YORK CHICAGO MONTREAL

Canada as owners of the Canadian National and the shareholders of the Canadian Pacific, E. W. Beatty, chairman and president of the latter company, carried his argument for unification of the railways for management purposes another step forward in an address before the Canadian Club in Winnipeg last week.

Under such an arrangement, he said, the joint railways would have the benefits of private administration and there would exist a common treasury from which an equitable division of net earnings would work towards the relief of the country in meeting interest charges as well as operating deficits. Unification, he predicted, would effect a saving of $75,000,000 annually to the country.

Canadian National Net Up in 1932

The Canadian National, excluding Eastern Lines, in 1932 had gross revenues of $143,414,873, while operating expenses were $133,374,947. Net operating revenue for the year totaled $10,039,925, an increase of $2,454,196 over 1931. Revenues were $33,858,864 below those of 1931 but operating expenses were reduced by $36,313,060. The operating ratio was 93 in 1932 as compared with 95.72 percent in 1931.

The Eastern Lines of the Canadian National, operated under the provisions of the Maritime Freight Rates Act, had gross revenues in 1932 of $17,688,720, a decrease of $5,542,703 from the 1931 figures. Operating expenses were $21,-

Operating Revenues and Operating Expenses of Class I Steam Railways in the United States

Compiled from the Monthly Reports of Revenues and Expenses for 168 steam railways, including 17 switching and terminal companies

FOR THE MONTH OF DECEMBER, 1932 AND 1931

Item	United States 1932	United States 1931	Eastern District 1932	Eastern District 1931	Southern District 1932	Southern District 1931	Western District 1932	Western District 1931
Average number of miles operated	241,911.79	242,180.33	60,103.32	60,205.03	45,922.93	46,130.07	135,885.54	135,845.23
Revenues:								
Freight	a $188,163,759	$214,476,394	$82,738,934	$92,635,420	$39,239,638	$42,280,608	$66,185,187	$79,560,366
Passenger	30,201,803	40,573,934	17,833,361	23,450,688	3,671,667	4,849,621	8,696,775	12,273,625
Mail	9,681,634	10,562,059	3,820,673	4,106,384	1,566,439	1,651,788	4,294,522	4,803,887
Express	4,227,430	6,273,921	1,566,773	2,789,223	793,076	926,889	1,867,581	2,557,809
All other transportation	b 8,305,196	10,068,770	4,881,984	5,864,376	623,775	775,560	2,799,437	3,428,834
Incidental	4,996,172	6,416,235	2,857,949	3,501,007	649,566	831,047	1,488,657	2,084,181
Joint facility—Cr.	709,898	537,951	213,012	*d 28,192*	121,854	141,958	375,032	424,185
Joint facility—Dr.	223,693	263,496	53,323	69,825	18,771	22,822	151,599	170,849
Railway operating revenues	246,062,199	288,645,768	113,859,363	132,249,081	46,647,244	51,434,649	85,555,592	104,962,038
Expenses:								
Maintenance of way and structures	21,365,413	30,352,647	8,824,440	12,603,814	4,058,724	6,142,674	8,482,249	11,606,159
Maintenance of equipment	50,985,243	60,445,467	24,818,874	27,609,459	8,812,234	10,917,637	17,354,135	21,918,371
Traffic	7,337,674	9,063,788	2,675,548	3,479,784	1,298,364	1,675,706	3,363,762	3,908,298
Transportation	93,684,564	117,992,478	43,899,405	57,080,237	15,320,845	18,685,318	34,464,314	42,226,923
Miscellaneous operations	2,107,281	3,063,740	1,092,557	1,541,195	237,021	334,201	777,703	1,188,344
General	12,768,303	15,055,416	5,585,636	6,727,100	2,154,327	2,526,055	5,028,340	5,802,261
Transportation for investment—Cr.	43,146	767,058	120,574	266,219	40,876	88,298	*d 118,304*	412,541
Railway operating expenses	188,205,332	235,206,478	86,775,886	108,775,370	31,840,639	40,193,293	69,588,807	86,237,815
Net revenue from railway operations	57,856,867	53,439,290	27,083,477	23,473,711	14,806,605	11,241,356	15,966,785	18,724,223
Railway tax accruals	15,760,341	16,270,582	7,312,562	7,703,081	2,665,658	3,171,819	5,782,121	5,395,682
Uncollectible railway revenues	173,914	134,673	105,315	53,566	30,391	27,261	38,208	53,846
Railway operating income	41,922,612	37,034,035	19,665,600	15,717,064	12,110,556	8,042,276	10,146,456	13,274,695
Equipment rents—Dr. balance	6,362,341	7,098,093	3,656,101	4,189,491	65,371	241,363	2,640,869	2,667,239
Joint facility rent—Dr. balance	2,703,376	2,317,550	2,033,323	1,299,804	292,457	215,844	377,596	801,902
Net railway operating income	32,856,895	27,618,392	13,976,176	10,227,769	11,752,728	7,585,069	7,127,991	9,805,554
Ratio of expenses to revenues (per cent)	76.49	81.49	76.21	82.25	68.26	78.14	81.34	82.16

FOR TWELVE MONTHS ENDED WITH DECEMBER, 1932 AND 1931

Average number of miles operated	242,138.15	242,266.29	60,160.80	60,229.90	46,112.60	46,136.15	135,864.75	135,900.24
Revenues:								
Freight	c $2,451,929,614	$3,256,493,487	$1,047,112,219	$1,371,284,550	$473,971,274	$619,373,219	$930,846,121	$1,265,835,718
Passenger	377,094,345	551,000,973	225,130,184	317,179,989	42,839,335	66,330,439	109,124,826	167,490,545
Mail	97,161,709	105,360,001	38,452,994	40,847,508	16,357,514	17,609,445	42,351,201	46,903,048
Express	53,983,054	82,755,297	23,522,635	37,083,179	9,030,876	13,070,366	21,429,543	32,601,752
All other transportation	e 109,846,648	142,399,484	64,494,854	82,553,834	7,792,722	10,651,052	37,559,072	49,194,598
Incidental	65,753,991	90,736,071	37,097,345	48,394,112	8,480,157	12,270,407	20,176,489	30,071,552
Joint facility—Cr.	8,987,939	11,060,138	2,973,957	3,333,311	1,635,664	2,006,471	4,378,318	5,720,356
Joint facility—Dr.	2,828,641	3,384,110	739,596	890,376	224,975	301,841	1,864,070	2,191,893
Railway operating revenues	3,161,928,659	4,236,421,341	1,438,044,592	1,899,786,107	559,882,567	741,009,558	1,164,001,500	1,595,625,676
Expenses:								
Maintenance of way and structures	354,921,211	535,840,430	141,909,336	225,846,595	69,053,842	103,347,844	143,958,033	206,645,991
Maintenance of equipment	623,551,414	823,405,467	284,582,763	380,970,706	112,867,686	149,872,076	226,100,965	292,562,685
Traffic	96,530,341	117,596,070	36,815,236	45,841,496	17,749,212	21,705,299	41,965,893	50,049,275
Transportation	1,172,988,646	1,564,437,566	549,645,757	740,225,437	189,104,116	254,847,666	434,238,773	569,364,463
Miscellaneous operations	28,059,611	41,584,876	13,966,308	20,292,942	3,135,835	4,682,805	10,957,468	16,609,129
General	157,273,688	183,981,555	68,480,127	80,384,106	26,779,151	31,919,421	62,014,410	71,678,028
Transportation for investment—Cr.	3,938,994	7,550,848	1,482,320	1,601,745	320,966	877,475	2,135,708	5,071,628
Railway operating expenses	2,429,385,917	3,259,295,116	1,093,917,207	1,491,959,537	418,368,876	565,497,636	917,099,834	1,201,837,943
Net revenue from railway operations	732,542,742	977,126,225	344,127,385	407,826,570	141,513,691	175,511,922	246,901,666	393,787,733
Railway tax accruals	279,284,244	308,007,641	119,027,521	127,750,554	50,433,184	57,059,189	109,823,539	123,197,898
Uncollectible railway revenues	1,033,795	900,828	440,069	337,860	181,318	181,785	412,408	381,183
Railway operating income	452,224,703	668,217,756	224,659,795	279,738,156	90,899,189	118,270,948	136,665,719	270,208,652
Equipment rents—Dr. balance	85,791,719	98,853,876	43,907,107	50,273,344	3,535,630	4,541,486	38,348,982	44,039,046
Joint facility rent—Dr. balance	32,107,985	31,418,392	18,009,179	17,267,243	3,591,877	3,246,127	10,506,929	10,905,022
Net railway operating income	334,324,999	537,945,488	162,743,509	212,197,569	83,771,682	110,483,335	87,809,808	215,264,584
Ratio of expenses to revenues (per cent)	76.83	76.94	76.07	78.53	74.72	76.31	78.79	75.32

a Includes $4,636,392 increase from "Ex Parte 103." b Includes $84,568 increase from "Ex Parte 103." c Includes $62,663,882 increase from "Ex Parte 103." d Deficit or other reverse items. e Includes $1,066,917 increase from "Ex Parte 103."

Compiled by the Bureau of Statistics, Interstate Commerce Commission. Subject to revision.

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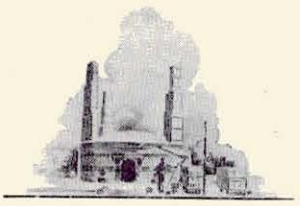
We Are Mighty Fussy About
ARCH BRICK QUALITY



Only the pick of the finest brick makers, chosen for their reputation, their modern equipment and their advantageous location, furnish the brick American Arch Company supplies the railroads.

These plants serve the railroads exclusively thru American Arch Company:

HARBISON-WALKER REFRACTORIES CO.
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Kentucky
Alabama
Missouri

NORTH AMERICAN REFRACTORIES CO.
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Kentucky

IRONTON FIRE BRICK CO.
Ohio

DENVER SEWER PIPE & CLAY CO.
Colorado

ATHENS BRICK & TILE CO.
Texas

MOULDING-BROWNELL CORP.
Ohio

GLADDING-McBEAN & CO.
California
Washington

DIAMOND FIRE BRICK CO.
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DOMINION FIRE BRICK & CLAY PRODUCTS LTD.
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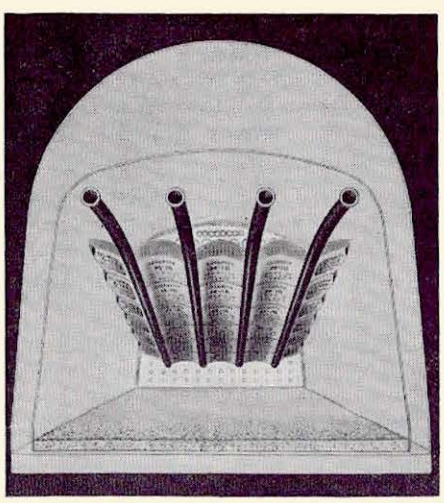
THERE'S MORE TO SECURITY ARCHES THAN JUST BRICK



The above plants supply the brick, American Arch Company supplies the design, engineering, and the service that, taken together, make a satisfactory Arch Brick supply.

AMERICAN ARCH COMPANY

INCORPORATED

NEW YORK CHICAGO

Locomotive Combustion Specialists

833,213, a reduction of $7,791,773 as compared with the previous year. The net revenue deficit on the Eastern Lines was $4,144,492, an improvement of $2,249,070 on the 1931 results.

Rate Reduction Argument Postponed

The Interstate Commerce Commission has extended from February 17 to March 9 the time which it had allowed the railways in which to file an answer to the petition filed by organizations representing agriculture and the coal and lumber industries asking a general reduction in freight rates on basic commodities; and it has also postponed to March 24 the oral argument which it had set for February 25 on the question as to whether it should make an investigation of the subject. This action was taken in response to a letter from Alfred P. Thom general counsel of the Association of Railway Executives, on which the commission's order was served, pointing out that it would be necessary to obtain the views of the railways themselves and suggesting that the time be extended for 30 days because "the proposals are so vast in their consequences and have such a far-reaching effect upon social and economic conditions generally and upon the carriers themselves."

Railroads Ask Reargument On Power Reverse Gear

The American Railway Association has petitioned the Interstate Commerce Commission for a reargument in the proceeding in which the commission recently, by Division 6, ordered the roads to equip with power-operated reverse gear all steam locomotives built after April 1, and on all those now in service, above certain specified weights, the first time they are given repairs of Class 3 or heavier. Pointing out that the carriers have found it necessary to institute most rigid economies, the petition says it is reasonable to expect that such repairs have been postponed when not immediately necessary but that they cannot be deferred indefinitely, and that "to require an outlay of substantial sums for purposes that the record conclusively shows are not imperatively needed would place an undue burden upon the carriers and, to that extent, affect their ability to furnish efficient and adequate transportation."

Waterway Conference to Be Held at Wichita

A conference on inland waterways will be held at Wichita, Kan., on February 23-24 under the auspices of the Wichita Chamber of Commerce, to which representatives of industrial and civic interests throughout the Middle West have been invited. The subjects docketed for discussion include Our Inland Waterways—Their Development and Use—Are They Economy or Waste?; Inland Waterways and Their Benefits to Agriculture; Inland Waterways and Government in Business; The Federal Barge Lines—Profit or Loss?; Regulation of Water Carriers; The Railroad Crisis; Effect of Inland Waterways Operation and Rates to Non-River Points; Inland Waterways Transportation — Its Cost and Its Value; and Beneficiaries of Inland Waterways Development. Among the speakers at the conference will be E. P. Ryan, traffic manager of the Grand Island, Neb., Chamber of Commerce; W. B. Lincoln, president of the Kansas City, Mo., Board of Trade; W. M. Borders, president of the Federation of American Business of the Southwest; Samuel O. Dunn, chairman of the Simmons-Boardman Publishing Company, and editor of the *Railway Age*; and Kenneth S. Wherry, former state senator of Pawnee City, Neb.

Senator Proposes to Bar Foreign Porters

A bill to require that "all employees of observation cars, club cars, and sleeping cars used in interstate commerce" by any railroad within the United States shall be American citizens was introduced in Congress on February 8 by Senator Dill, of Washington. He said that some of the railroads are now employing Japanese and Filipino porters at such low rates of pay that in some instances two are employed on a Pullman car to do the work regularly done by one American (colored) porter.

A. R. E. A. Convention Program

Final arrangements have been practically completed for the thirty-fourth annual convention of the American Railway Engineering Association. As in recent years, the meeting will be held in the Palmer House, Chicago, but, as in 1931 and 1932, the session will be for two days only, March 14 and 15. The program follows:

Tuesday Morning
President's address, John V. Neubert, chief engineer maintenance of way, New York Central.
Reports of secretary and treasurer.
Reports of committees on:
Uniform General Contract Forms,
Wooden Bridges and Trestles,
Iron and Steel Structures,
Clearances,
Electricity,
Signals and Interlocking.
Tuesday Afternoon
Yards and Terminals,
Shops and Locomotive Terminals,
Records and Accounts,
Waterproofing Railway Structures,
Standardization,
Maintenance of Way Work Equipment.
Tuesday Evening
Stresses in Railroad Track,
Rail.
Wednesday Morning
Roadway,
Ballast,
Track,
Ties,
Wood Preservation,
Rules and Organization.
Wednesday Afternoon
Economics of Railway Operation,
Economics of Railway Labor,
Water Service and Sanitation,
Buildings,
Masonry,
Grade Crossings.

As a part of the report of the Committee on Maintenance of Way Work Equipment on Tuesday afternoon, a talking motion picture will be shown, while the reports of the committees on Stresses in Railroad Track and on Rail, on Tuesday evening, will both be illustrated with lantern slides. On Wednesday a luncheon will be served in the Red Lacquer room for members of the A. R. E. A. and the National Railway Appliances Association and their guests, with a short program during which F. E. Williamson, president of the New York Central, will give a short address.

Supply Trade

W. N. Barker, assistant to the president of the **Pullman Car & Manufacturing Corporation**, Chicago, has been appointed also assistant to the president of the **Standard Steel Car Company.**

Charles L. Gilbert has been elected vice-president and treasurer of the **Scullin Steel Company**, St. Louis, Mo., to fill the vacancy caused by the death of **V. C. Turner** and **Edward F. Judge** has been elected assistant treasurer in addition to his duties as secretary.

Chicago Railway Equipment Company

The annual report of the Chicago Railway Equipment Company for 1932 shows a net loss of $380,371 as compared with a net loss of $525,003 in 1931, and a net profit of $261,455 in 1930. The loss for 1932 is the second the company has reported since 1894. Of the loss in 1932, $222,692 is contributed by operations after deducting manufacturing, selling and administrative expenses, while $157,679 includes depreciation of plant and equipment, inventory adjustments and uncollectible accounts written off. Current assets as of December 31, 1932, total $2,200,454, and current liabilities $69,884.

Lima Locomotive Works, Inc., Annual Report

The Lima Locomotive Works, Inc., for the year ending December 31, 1932, reported a net loss of $890,537 as compared with a 1931 net loss of $1,414,129. In common with other locomotive builders, this company received last year no railway orders for steam locomotives, and locomotives among its unfilled orders at the close of the year, the report says, "are electrically operated and the reason for delayed delivery is the fact that the railroad company for which they are being built has not been in position to place them in operation."

The balance sheet as of December 31, 1932, lists current assets of $5,786,248 as against current liabilities of $143,190, the excess of current assets over current liabilities being $5,643,058. Included among the current assets is $389,635 in cash and $2,023,281 in United States Government securities. The company has no bonded debt and no bank loans, and but one class of stock. During last year it purchased 15,800 shares of its own stock, thus bringing the treasury holdings to 40,800 shares or 19.3 per cent of the total outstanding.

The report says in closing that: "It is impossible to state with any degree of assurance when the purchase of equipment by railroads will be resumed. The effective capacity of locomotives in use, for economical operation, which will be insufficient to meet the demand when railway traffic shall have been restored to more nearly normal proportions, the large amount of equipment that, due to deterioration and obsolescence, is not in proper condition for maintaining continuous, satisfactory service, and the recent definite tendency toward a general improvement in carloadings, as compared with the falling off that has been

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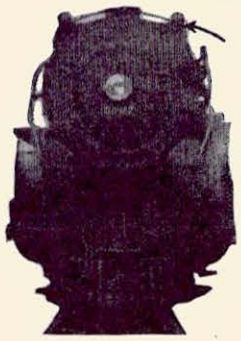
A Sign of the Times

Reduce Locomotive Fuel Costs with Elesco Feed Water Heaters

THE ELESCO FEED WATER HEATER



Railroads actively interested in a saving of the total fuel burned in their locomotives can save 12 to 15 per cent by applying Elesco feed water heaters. A portion of the exhaust steam—otherwise wasted—is used in the heater to preheat the feed water, thus reducing by 12 to 15 per cent the fuel needed in the firebox. This method is the most practical way in which waste heat can be simply and efficiently returned to the boiler . . . . . thus saving fuel and in other ways improving the performance of a locomotive.

If you are interested in reducing locomotive fuel costs, send *today* for literature on the Elesco feed water heater. Just tear out this advertisement, put your name and address on the margin and mail it to us. Full particulars will be sent to you—with no obligation.

THE SUPERHEATER COMPANY

***Representative of* American Throttle Company, Inc.**

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Peoples Gas Building
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Canada: The Superheater Company, Limited, Montreal

Superheaters ▲ Feed Water Heaters ▲ Exhaust Steam Injectors ▲ Superheated Steam Pyrometers ▲ American Throttles

reported each year since 1929, all point toward the resumption of equipment purchasing by the railroads as soon as general business conditions warrant. The longer this buying is postponed, the greater will be the ultimate demand."

OBITUARY

William T. Beatty, chairman of the board of the Austin-Western Road Machinery Company and Austin Manufacturing Company, Chicago, died at San Francisco, Cal., on February 6. Mr. Beatty was president of those companies from 1911 to 1931 when he was made chairman of the board.

Charles Edward Patterson, former vice-president of the General Electric Company and president of the General Electric Supply Corporation, who retired from active business a few years ago, died at St. Petersburg, Fla., on February 12 after an illness of several months. In 1901 Mr. Patterson was assistant comptroller of the New York Central. He was then elected comptroller of the American Locomotive Company and after eight years with that company he became associated with the General Electric Company, and in 1913 was elected comptroller. Mr. Patterson was elected a vice-president of the company in 1920.

Equipment and Supplies

PASSENGER CARS

THE MISSOURI-KANSAS-TEXAS contemplates buying four lounge cars.

MACHINERY AND TOOLS

THE DELAWARE, LACKAWANNA & WESTERN is inquiring for one 46-in. engine lathe, one cotter and key seat miller, one slotting machine and four electric welding machines. The company placed an order recently for a Niles car wheel lathe.

Construction

NEW YORK CENTRAL.—A contract has been awarded to the Arthur McMullen Company, New York, for reconstruction work on bridge No. 199 at John and Union streets, Poughkeepsie, N. Y. The work involves the placing of about 200 tons of steel which contract has been let to the American Bridge Company.

WABASH.—United States District Judge Charles B. Davis, St. Louis, Mo., has authorized the receivers for this railroad to enter into an agreement with the Missouri State Highway Department and St. Louis county for the construction of a subway to carry State Highway No. 77 under the railroad's tracks near Robertson. This project has an estimated cost of $60,000, which will be borne equally by the railroad and the state.

Financial

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC.—*Acquisition.*—This company has applied to the Interstate Commerce Commission for authority to acquire by purchase and to operate 18.23 miles of the line of the La Crosse & Southeastern, in Vernon county, Wis., and the latter company has applied to the commission for authority to abandon its operation of the road.

CINCINNATI UNION TERMINAL.—*Bonds.*—The Interstate Commerce Commission has authorized this company to issue $12,000,000 of first mortgage, 5 per cent bonds, series C, authorized for sale to J. P. Morgan & Co. and Kuhn, Loeb & Co. at 97½, making the average annual cost 5.183 per cent. The proceeds are to used to pay a loan to the Reconstruction Finance Corporation and to complete the company's construction project.

DELAWARE & HUDSON.—*Notes.*—The Interstate Commerce Commission has authorized this company to issue and reissue from time to time $7,750,000 of promissory notes.

ERIE.—*Bonds Extended.*—Bankers have underwritten an extension of an issue of $4,616,000 of New York & Erie third mortgage extended 4½ per cent bonds due March 1. The railroad offers $53.66 in cash for each $1000 bond offered for extension to March 1, 1938, thus making the net cost of a $1000 bond $946.34 and increasing the yield from 4½ per cent to 5.75. The bankers will purchase the bonds which holders do not care to extend.

GALVESTON, HOUSTON & HENDERSON.—*R. F. C. Loan.*—This company has applied to the Reconstruction Finance Corporation for a loan of $2,122,000 to pay an issue of first mortgage bonds due April 1.

GREAT NORTHERN.—*Bonds.*—This company is asking holders of its first and refunding mortgage bonds to assent to the extension of the principal of $41,963,000 of consolidated mortgage bonds of the St. Paul, Minneapolis & Manitoba for a period of not exceeding 15 years beyond their maturity which falls on July 1. On all bonds deposited for stamping under the plan prior to April 1 the company will pay the interest due July 1. Holders of a large amount of these bonds, it is announced, have already assented to the plan.

GREAT SOUTHERN. — *Reorganization.* — This company is being reorganized to eliminate its bonded indebtedness, the bonds being held by the stockholders in the same proportion as their stock holdings. Forty-one miles of line are in operation and an extension, it is expected, will be completed in the spring. Stephen A. Hull, Terminal Sales Building, Portland, Ore., is president.

GRAND TRUNK-PENNSYLVANIA TRANSPORTATION COMPANY.—*Car Ferry Service.*—This company has applied to the Interstate Commerce Commission for a certificate authorizing its proposed car ferry service between Milwaukee, Wis., and Muskegon, Mich., if one is found necessary, stating that there is some question as to whether it is a carrier by railroad.

LEHIGH VALLEY.—*Obligation and Liability.*—The Interstate Commerce Commission has authorized this company to assume obligation and liability as guarantor for $2,600,000 of Consolidated Real Estate Company's bonds to be pledged with the Railroad Credit Corporation to secure a loan of $1,500,000.

LOUISVILLE & NASHVILLE. — *Abandonment.*—This company has applied to the Interstate Commerce Commission for authority to abandon its line from Princeton Junction, Tenn., to Gracey, Ky., 32 miles, and also 9.4 miles of a branch line in Jefferson county, Ala.

MINNEAPOLIS & ST. LOUIS.—*R. F. C. Loan Opposed.*—Philip J. Roosevelt, chairman of the reorganization committee, has addressed a letter to the Reconstruction Finance Corporation and the Interstate Commerce Commission opposing the granting of the loan of $1,027,174 asked by the receivers. Pointing out that over a period of years this carrier has not been able to earn a reasonable return under any scale of rates which the commission has been willing to approve, the letter says: "Since at the present time there is apparently no reasonable basis for expecting that this situation will be changed, the reorganization committee believes that it is unfair, unlawful and contrary to the public interest to postpone through prior lien borrowings the time when operations cease, thereby consuming what little value remains in the property for the investor." It was also declared that the property is now being operated as a charitable enterprise to pay wages and taxes which are not being earned.

MISSOURI PACIFIC.—*Bonds.*—The Interstate Commerce Commission has authorized this company to issue not more than $10,000,000 of first and refunding mortgage 5 per cent bonds and, subject to their pledge with the Reconstruction Finance Corporation, to pledge its equity therein with the Railroad Credit Corporation as collateral security for notes.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—*R. F. C. Loan.*—This company has applied to the Reconstruction Finance Corporation for a two-year extension of its one-year loans from the corporation, of which one for $1,184,130, on which $209,668 has been repaid, comes due on February 27, one for $100,000 is due April 28, and one for $425,000 is due June 10.

NEW YORK, CHICAGO & ST. LOUIS.—*J. J. Bernet Authorized to Become Officer.*—The Interstate Commerce Commission on February 10 made public an order dated February 6 authorizing J. J. Bernet, president of the Chesapeake & Ohio and of the Pere Marquette, to serve also as director and to hold any office or offices with the New York, Chicago & St. Louis, on condition that before he entered upon the performance of his duties in any position pursuant to that authority, there should be filed with the commission written notice of his election or appointment. Mr. Bernet

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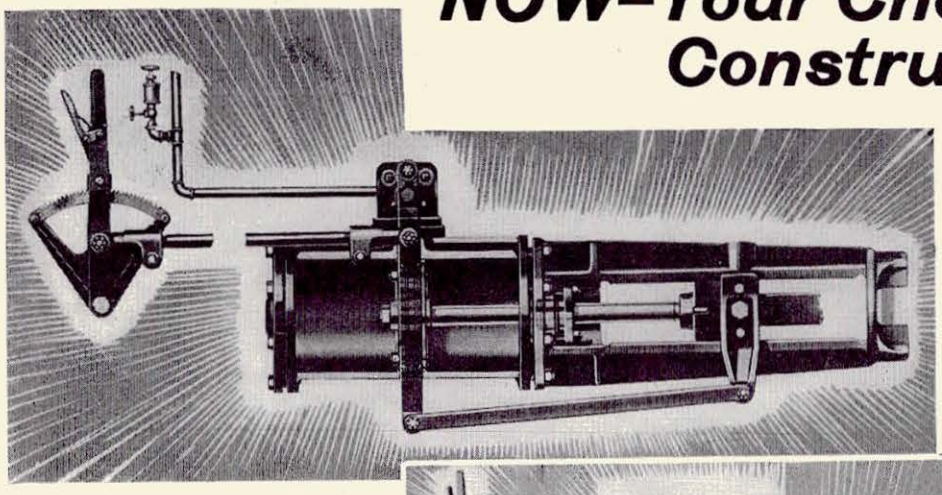
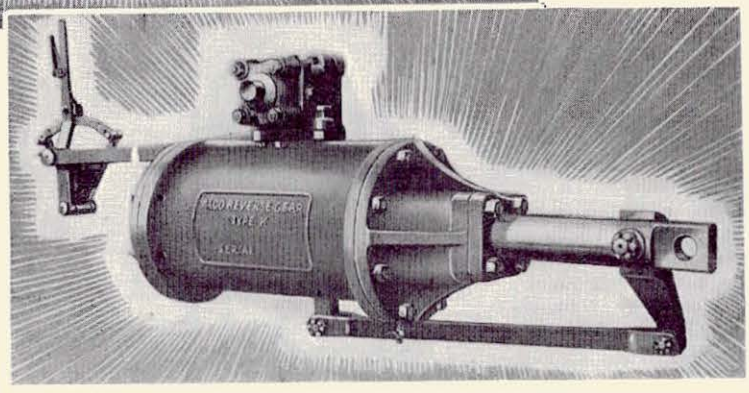
Alco REVERSE GEARS...

NOW—Your Choice of Two Constructions . . .



Type "G" Gear with crosshead and guides.



Type "K" Gear with trunk-piston rod.

RAILWAY men when buying reverse gears can obtain the regular well known Alco Type "G" Gear with its crosshead and guides. Thousands are operating satisfactorily on different roads without a complaint.

Or if they prefer, they can get the new Alco Type "K" Gear equipped with the less expensive trunk-piston rods. This gear is lighter and shorter and is especially adaptable for new or existing power where lower cost, lighter weight and space limitations are important factors. Both gears are powerful, fast, accurate and easy to operate. They possess every requisite for efficiency and economy and have many parts in common.

American Locomotive Company
30 Church Street New York N.Y.

was elected president of the Nickel Plate on February 8.

PENNSYLVANIA.—*Abandonment.*—Examiner J. S. Pritchard of the Interstate Commerce Commission has recommended in a proposed report that the commission authorize the abandonment of a portion of the Muncie branch of the Pittsburgh, Cincinnati, Chicago & St. Louis from Converse, Ind., to Matthews, 26 miles.

SOUTHERN PACIFIC.—*Bonds.*—The Interstate Commerce Commission has authorized this company to substitute its uncapitalized equity in certain equipment, totaling $15,957,000, for a like amount of capital expenditures as part of the basis for the issuance of $50,000,000 of 50-year 4½ per cent bonds, and to pledge as collateral for short term notes $13,418,000 of Galveston, Harrisburg & San Antonio first mortgage, Mexican & Pacific extension, 5 per cent bonds and $2,539,000 of Galveston, Harrisburg & San Antonio second mortgage, Mexican & Pacific extension, 5 per cent bonds.

UNION PACIFIC. — *Unification.* — This company has petitioned the Interstate Commerce Commission for a reargument before the full commission in the case in which Division 4 authorized acquisition of control of subsidiary companies subject to the condition that it agree to abide by such findings as the commission might make with respect to acquisition of the Laramie, North Park & Western and the Pacific & Idaho Northern. The petition says the proposed acquisition is a "strictly family affair" which it is entitled to have approved as a matter of right and that it is only by virtue of its practice of the strictest economy that the Union Pacific is one of the few railroads which thus far have been able to earn their fixed charges. Pointing to the economies already effected the petition said its proposal is an emergency one designed to realize economies estimated at $600,000 a year by a mere change in the legal status of the different properties involved.

Average Prices of Stocks and of Bonds

	Feb. 14	Last week	Last year
Average price of 20 representative railway stocks..	25.43	25.93	35.65
Average price of 20 representative railway bonds..	57.18	58.13	69.07

Dividends Declared

Boston & Albany.—$2.00, quarterly, payable March 31 to holders of record February 21.

Cincinnati, New Orleans & Texas Pacific.—Preferred, $1.25, quarterly, payable March 1 to holders of record February 15.

Columbus & Xenia.—$1.10, quarterly, payable March 10 to holders of record February 25.

Delaware & Bound Brook.—$2.00, quarterly, payable February 20 to holders of record February 10.

Fort Wayne & Jackson.—$2.75, semi-annually, payable March 1 to holders of record February 20.

Grand Rapids & Indiana.—$2.00, semi-annually, payable June 20 to holders of record June 10.

Lackawanna R. R. of New Jersey.—4 Per Cent Guaranteed, $1.00, quarterly, payable April 1 to holders of record March 7.

Northern R. R. of New Jersey.—4 Per Cent Guaranteed, $1.00, quarterly, payable March 1 to holders of record February 18.

North Pennsylvania.—$1.00, quarterly, payable February 25 to holders of record February 20.

New York, Lackawanna & Western.—5 Per Cent Guaranteed, $1.25, quarterly, payable April 1 to holders of record March 14.

Union Pacific. — Common, $1.50; Preferred, $2.00, semi-annually, both payable April 1 to holders of record March 1.

Railway Officers

EXECUTIVE

Effective February 1 the San Diego & Arizona transferred all its properties to the San Diego & Arizona Eastern, which will continue their operation. Officers and employees of the San Diego & Arizona will be continued in same positions with the new company with duties and headquarters as heretofore.

R. L. Pearson, general manager of the New York, New Haven & Hartford and **F. J. Wall,** general traffic manager, with headquarters at New Haven, Conn., were elected vice-presidents on February 14. Mr. Pearson will have jurisdiction over the operating, engineering and construction departments, and Mr. Wall will have charge of the traffic department. Mr. Pearson was born on April 2, 1882, at Philadelphia, Pa. He was educated at Swarthmore College and entered railway service in June, 1903, as transitman for the American Railways Company. He entered the service of the New Haven in 1904 as inspector in the construction department, later in the same year he became transitman in that department, where he served until 1907, at which time he was transferred to the maintenance department in the same capacity.

R. L .Pearson

In October, 1908, Mr. Pearson was appointed assistant engineer and in September, 1914, he became track supervisor. Two years later he was appointed division engineer in the maintenance department. From October, 1917, to September, 1918, Mr. Pearson was with the U. S. Shipbuilding Company at Hog Island, returning to the New Haven on the latter date as division engineer, also serving in the same capacity on the Central New England Railroad. He was appointed maintenance engineer for these two roads in 1921, and in 1923 he was advanced to the position of engineer maintenance of way, holding that post until October, 1929, when he was promoted to chief engineer. In January, 1931, he became assistant general manager, and in the later part of that year he was appointed general manager, the position he held until his recent appointment.

Mr. Wall was born at Hartford, Conn., on May 8, 1886, and received his higher education at Yale University. He started his railroad career as a yard clerk at New Haven during the summer, while still attending high school. On leaving college he secured a position in the freight agent's office at New Haven and soon afterwards was transferred to the New England Steamship Company, working on that company's boats as checker. In 1912, he was promoted to agent of the New Bedford, Martha's Vineyard & Nantucket Steamboat Company at New Bedford, Mass. In 1916, he was advanced to superintendent of that line. In 1920, Mr. Wall was transferred to New York, where he became assistant to vice-president of operation of the New England Steamship Company, and in July, 1929, he was transferred to New Haven, as assistant to vice-president. On December 1, 1930, Mr. Wall was appointed general traffic manager in charge of traffic for the railroad and subsidiary companies, the position he held until his recent appointment.

F. J. Wall

FINANCIAL, LEGAL AND ACCOUNTING

P. D. Aliaga, assistant auditor of the Kansas City, Mexico & Orient (Mexico), has been promoted to auditor, with headquarters as before at Cd. Juarez, Chih., Mex., succeeding **C. H. Bavin,** who has resigned.

OPERATING

T. F. Custer has been appointed chief dispatcher on the Southern Pacific, with headquarters at Dunsmuir, Cal., succeeding **M. A. Wallace,** deceased.

R. C. Williams, superintendent of the Illinois division of the Missouri Pacific, with headquarters at Bush, Ill., effective February 1, has had his jurisdiction extended to include the St. Louis Terminal division, and will have headquarters at St. Louis, Mo. **A. R. Miller,** superintendent of the St. Louis Terminal division, at St. Louis, has been appointed to the newly-created position of assistant superintendent

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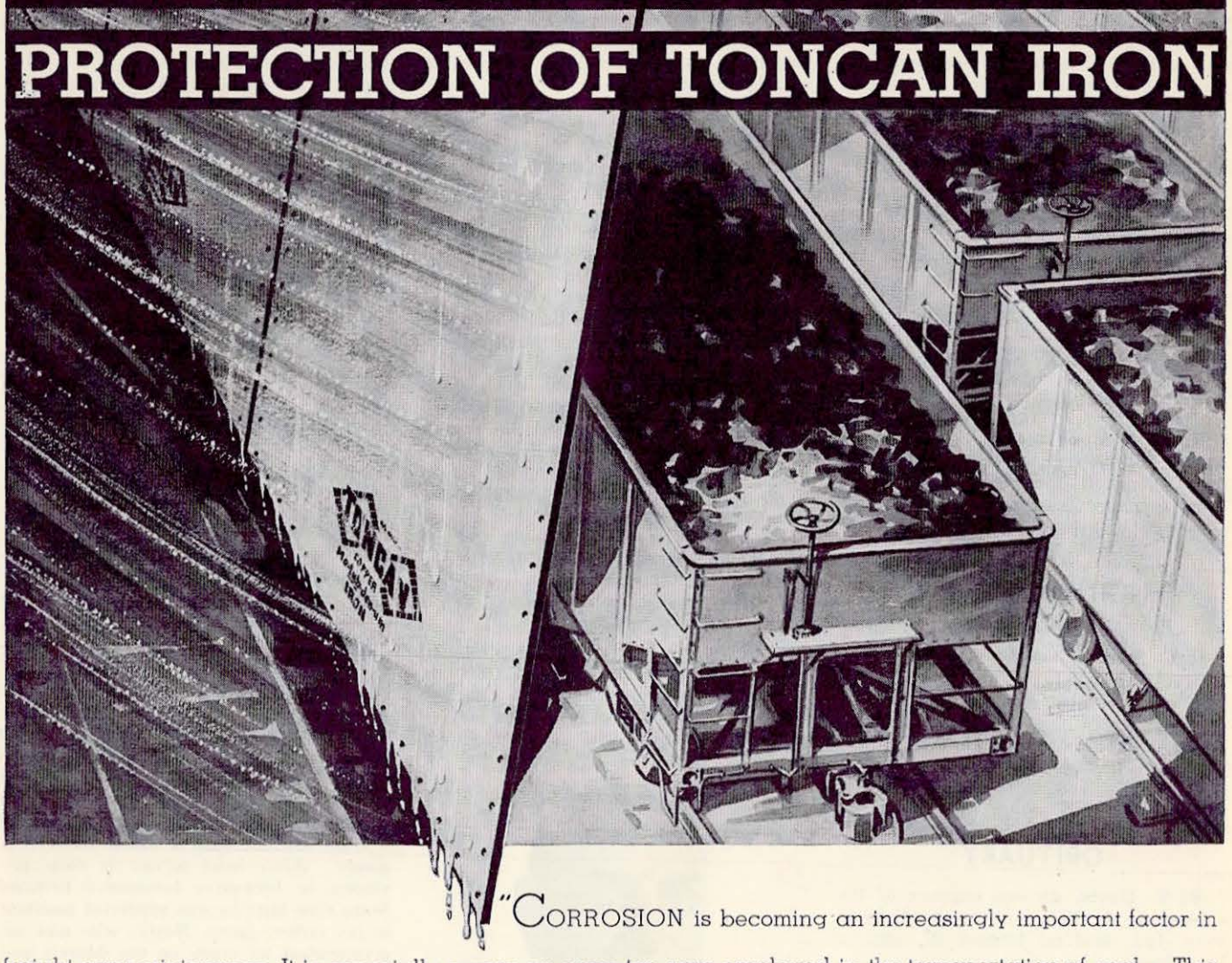
GIVE COAL CARS THE PROTECTION OF TONCAN IRON



"CORROSION is becoming an increasingly important factor in freight car maintenance. It is especially severe on open-top cars employed in the transportation of coal. » This coal, when exposed to rain and snow, is particularly destructive to the bottoms and sides of cars, with the result that these parts normally fail from corrosion and their premature renewal is necessitated. » The results constitute a drain on railway income that runs into the tens of millions of dollars annually."—RAILWAY AGE EDITORIAL

Corrosion is no longer an evil to be regretted but accepted as a necessity. » No longer need you tolerate the quick rusting through of car plates in exposed locations. » Toncan Iron car plates resist corrosion better than ordinary car plates due to their special alloy composition of refined iron, copper and molybdenum. » Many miles of freight cars built of Toncan Iron plates are enjoying lower maintenance due to the superior rust resistance of this modern iron. » Build your new cars of Toncan Iron and cut down on repairs.

Toncan Iron Boiler Tubes, Pipe, Plates, Culverts, Rivets, Staybolts, Tender Plates and Firebox Sheets • Sheets and Strip for special railroad purposes • Agathon Alloy Steels for Locomotive Parts • Agathon Engine Bolt Steel • Agathon Iron for pins and bushings • Agathon Staybolt Iron • Climax Steel Staybolts • Upson Bolts and Nuts • Track Material, Maney Guard Rail Assemblies • Enduro Stainless Steel for dining car equipment, for refrigeration cars and for firebox sheets • Agathon Nickel Forging Steel.

The Birdsboro Steel Foundry & Machine Company of Birdsboro, Penna. has manufactured and is prepared to supply, under license, Toncan Copper Molybdenum Iron castings for locomotives.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES YOUNGSTOWN, OHIO

TONCAN COPPER MO-LYB-DEN-UM IRON

of the same division. **O. M. Stevens,** superintendent of the Wichita division at Wichita, Kan., has had his jurisdiction extended to include the Joplin-White River divisions, and **A. R. Taylor,** superintendent of these divisions, has been appointed to the newly-created position of assistant superintendent, with headquarters as before at Nevada, Mo.

TRAFFIC

W. T. McNamara, general freight and passenger agent of the Litchfield & Madison, has had his headquarters moved from St. Louis, Mo., to Edwardsville, Ill.

J. F. Graves has been appointed general traffic manager of the Cumberland & Pennsylvania, and **F. E. Siepert,** assistant traffic manager, has been appointed traffic manager succeeding Mr. Graves.

R. M. Campos and **S. J. Llanos,** assistants to the freight traffic manager of the National Railways of Mexico, have been appointed assistant freight traffic managers, with headquarters as before at Mexico, D. F.

ENGINEERING AND SIGNALING

J. E. Beatty, district engineer of the Quebec district of the Canadian Pacific, has been appointed engineer, maintenance of way, eastern lines succeeding the late **A. C. Mackenzie. D. Hillman,** engineer of construction at Montreal, has been appointed to succeed Mr. Beatty as district engineer.

OBITUARY

B. V. Davis, division engineer of the Chesapeake & Ohio, with headquarters at Peru, Ind., died on January 27, after a brief illness.

C. A. Barnes, general foreman of the Belt Railway of Chicago, died, at Indianapolis, Ind., on December 26, 1932, following an illness of four months.

Frank D. Dale, auditor of station accounts of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Chicago, died on January 15 in that city.

Arthur J. Shaw, right of way, tax and claim agent of the Spokane International, with headquarters at Spokane, Wash., died on January 30, at the age of 76, following a lingering illness.

Thomas H. Gorman, retired general freight agent for the American Refrigerator Transit Company, with headquarters at St. Louis, Mo., died at the Missouri Pacific hospital in that city on January 30, following a lingering illness. Mr. Gorman was 67 years of age.

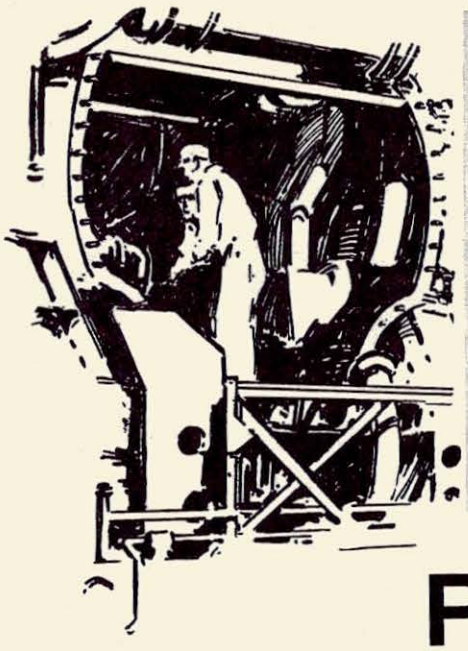
Allan C. MacKenzie, engineer, maintenance of way, eastern lines of the Canadian Pacific, who died suddenly at Montreal, Que., on January 24, as reported in the *Railway Age* of January 28, page 128, was born at Inverness, Scotland, on April 19, 1881. Mr. MacKenzie came to Canada in 1903, and immediately entered the service of the Canadian Pacific engineering department. He served as draftsman in the chief engineer's office, resident engineer on construction, division engineer on maintenance at Farnham, and, in 1912, he was appointed engineer, maintenance of way, eastern lines, the position he held until his death.

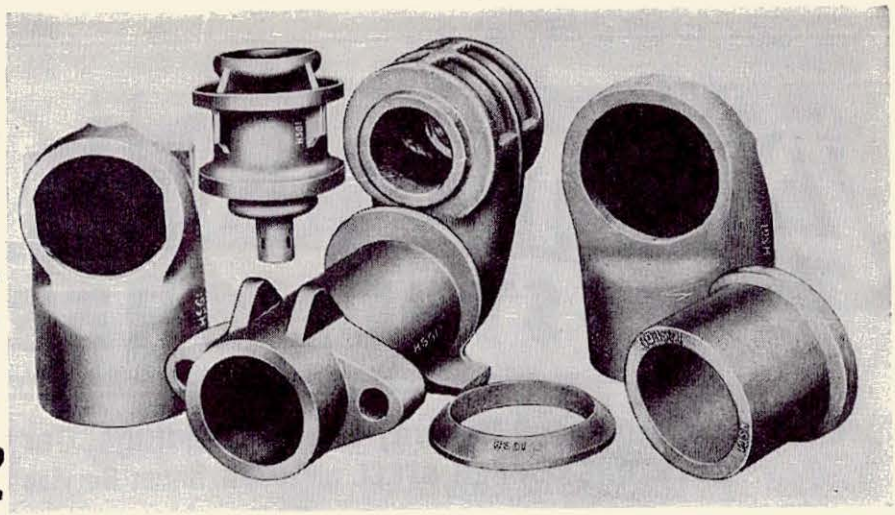
Charles L. Hinkle, who retired in 1930 as vice-president in charge of operation of the Chicago Great Western, with headquarters at Chicago, died on February 10 at Glendale, Cal. Mr. Hinkle was born on May 16, 1866, in Indiana and entered railway service in 1879 as a water boy in the bridge and building department of the Evansville & Terre Haute (now part of the Chicago & Eastern Illinois). Subsequently, he was advanced through the positions of laborer in a stone mason's gang, telegraph operator, station agent, chief clerk in the mechanical department and general storekeeper. In 1905, he became traveling auditor on the Evansville & Terre Haute and in 1906 he was promoted to assistant to the general manager and to assistant to the vice-president of a combination of railroads including the Chicago & Alton (now the Alton), the Toledo, St. Louis & Western (now part of the New York, Chicago & St. Louis) and the Minneapolis & St. Louis. Six years later, Mr. Hinkle was advanced to superintendent on the Toledo, St. Louis & Western, with headquarters at Frankfort, Ind., and in 1914, he was further promoted to general superintendent with the same headquarters. During the World War, Mr. Hinkle served as a major in the Transportation Corps of the United States Army, being until 1919 general superintendent of the 15th Grand Division in France. Following the signing of the armistice, he was appointed general manager of the army transportation activities in France and was awarded the ribbon of the Legion of Honor of France and the insignia of the American Distinguished Service medal. He was honorably discharged from the army with the rank of colonel, and on May 1, 1920, was appointed general manager of the Chicago Great Western at Chicago. On May 6, 1929, he was elected to the newly-created position of vice-president in charge of operation, which position he held until his retirement.

Charles L. Hinkle

Andrew J. Neafie, principal assistant engineer of the Delaware, Lackawanna and Western, with headquarters at Hoboken, N. J., died at his home in Mountain Lakes, N. J., on February 11 at the age of 67. The death of Mr. Neafie brought to a close a period of practically 53 years of continuous service in the maintenance of way department of the Lackawanna. Mr. Neafie was born on November 24, 1865, at Port Coldon, N. J., and received his education in the public schools of Boonton, N. J., and through a series of correspondence courses. He started his railroad career in 1879, when he entered the employ of the Lackawanna as a relief man in the maintenance of way stores department. On April 1, 1882, he became a steam shovel fireman, and shortly thereafter he became a craneman and then a steam shovel engineer. After brief service in these positions, he became a locomotive fireman. Some time later he was appointed assistant to his father, James Neafie, who was superintendent of track on the Morris and Essex division. He continued in this capacity until 1899, when he was appointed division roadmaster on the Morris and Essex division. Shortly after this promotion he was appointed general roadmaster of the entire road, and then, in 1903, was promoted to the position of principal assistant engineer, which position he held until the time of his death. In this latter capacity, Mr. Neafie was in general charge of all track maintenance, including wrecking work and supervision over the road's frog and switch shop and timber treating plant, and, in addition, he had supervision over, the construction of all new tracks or track changes in connection with the extensive grade crossing elimination and grade and line revision work which the Lackawanna has carried out at many points. While performing his many routine duties, which resulted in a continual improvement in the standard of maintenance on the Lackawanna, Mr. Neafie was interested constantly in a wide scope of development work to improve maintenance materials and methods of performing maintenance work. He contributed largely toward the development of a number of specific maintenance of way materials and devices, and was the inventor of the Neafie rail joint, and the Neafie oil spraying car used in the oiling of rail and track fastenings.

A. J. Neafie





Prevents Expensive Dry Pipe Repairs

NO item under "running repairs" takes more time or is more expensive than a leaky dry pipe.

Most of the failures develop in the castings fitted to the dry pipe. Why use ordinary materials for these vital parts?

You can eliminate these expensive failures and reduce your maintenance costs by applying Dry Pipe Sleeves, Elbows, Stand Pipes, and Throttle Boxes made of HUNT-SPILLER *Air Furnace* GUN IRON.

Castings made from this uniform material are not affected by high temperatures - - they are free from those foundry defects which are the cause of dangerous leaks. Their use results in substantial savings in the maintenance of their parts.

HSGI
Reg. U. S. Trade Mark

Cylinder Bushings
Cylinder Packing Rings
Pistons or Piston Bull Rings
Valve Bushings
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Parts Finished For Application

Dunbar Sectional Type Packing
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for Cylinders and Valves
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Valve Rings All Shapes

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Export Agent for Latin America:
International Hwy. Supply Co., 30 Church Street, New York, N. Y.

HUNT-SPILLER GUN IRON

Air Furnace

AMERICAN STEEL SHEETS

Specially Adapted for all Railway Uses—Buildings, Car Roofs, Culverts, Tanks, Etc.

KEYSTONE COPPER STEEL gives Maximum Service and Rust Resistance

This Company manufactures a complete line of AMERICAN Apollo Best Bloom Galvanized Sheets, Galvannealed Sheets, Heavy-Coated Galvanized Sheets, and Sheets for Special Purposes; also genuine

USS STAINLESS Steel Sheets and Light Plates

KEYSTONE Rust Resisting Copper Steel Sheets. AMERICAN Roofing Terne Plates and Long Ternes are well known in the building construction field. Write for full information relative to your requirements.

American Sheet and Tin Plate Company

General Offices: Frick Building, Pittsburgh, Pa.

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AMERICAN SHEET AND TIN PLATE COMPANY
AMERICAN STEEL & WIRE COMPANY
CARNEGIE STEEL COMPANY
COLUMBIA STEEL COMPANY
CYCLONE FENCE COMPANY
ILLINOIS STEEL COMPANY
NATIONAL TUBE COMPANY
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The 800 cars recently purchased for the 8th Avenue (New York) Subway have Agasote for the Headlining, Steelasote for Wainscoting and Pantasote for the Motorman's Curtains.

Pantasote Products have contributed to lower maintenance costs in every transportation field for more than thirty years.

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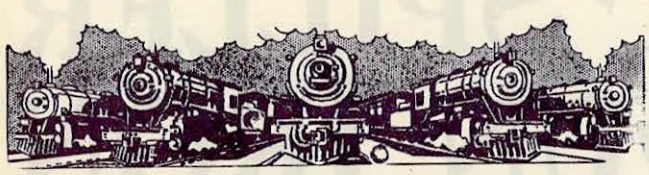

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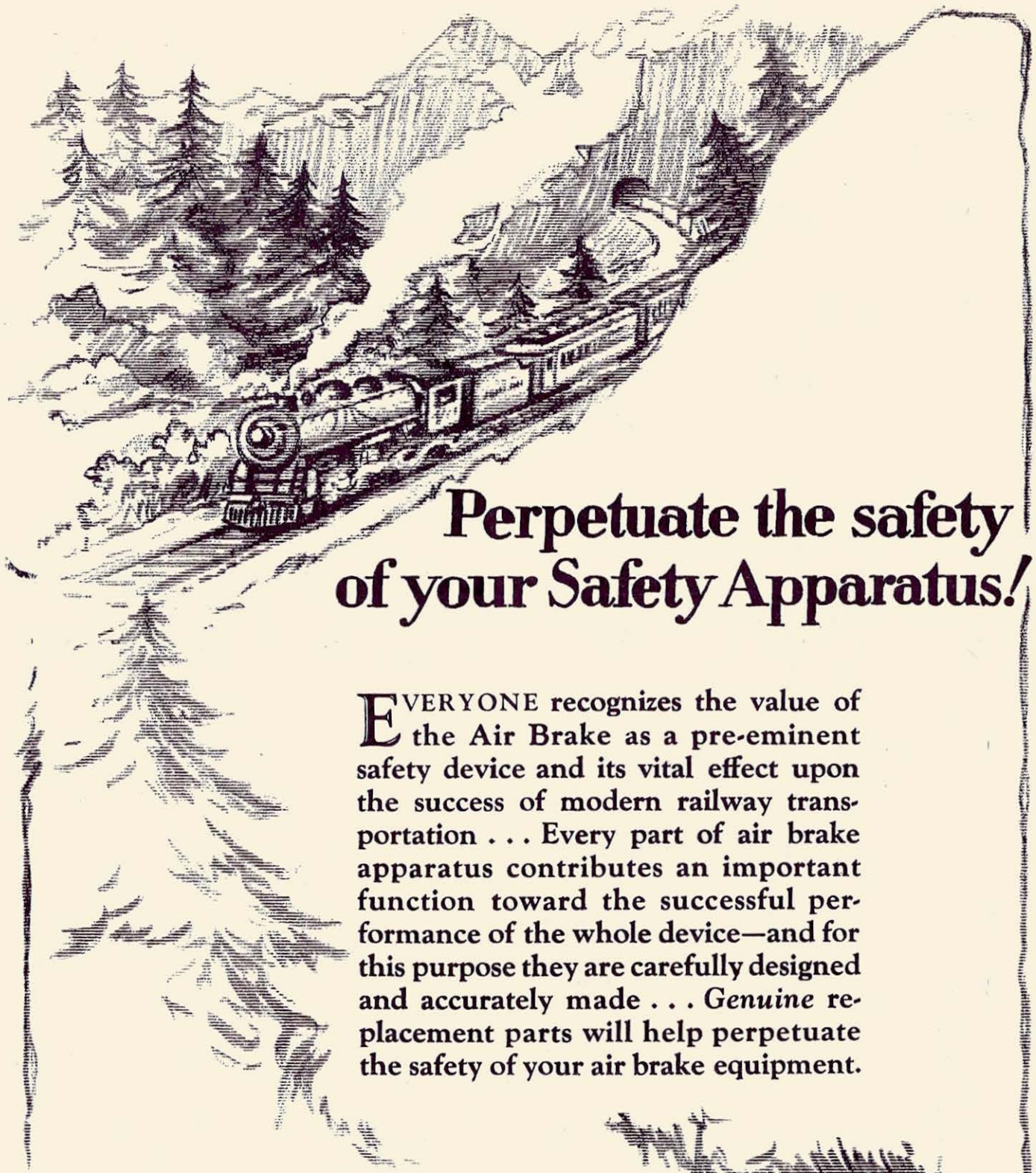
(INCORPORATED)

Journal Bearings

AND

Bronze Engine Castings

New York Chicago



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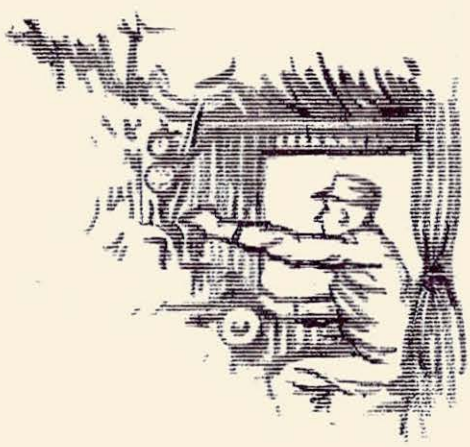
EVERYONE recognizes the value of the Air Brake as a pre-eminent safety device and its vital effect upon the success of modern railway transportation . . . Every part of air brake apparatus contributes an important function toward the successful performance of the whole device—and for this purpose they are carefully designed and accurately made . . . *Genuine* replacement parts will help perpetuate the safety of your air brake equipment.



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A. R. A.
STANDARD COUPLERS

Including

SWIVEL COUPLERS

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STEEL CASTINGS

McConway & Torley Corporation
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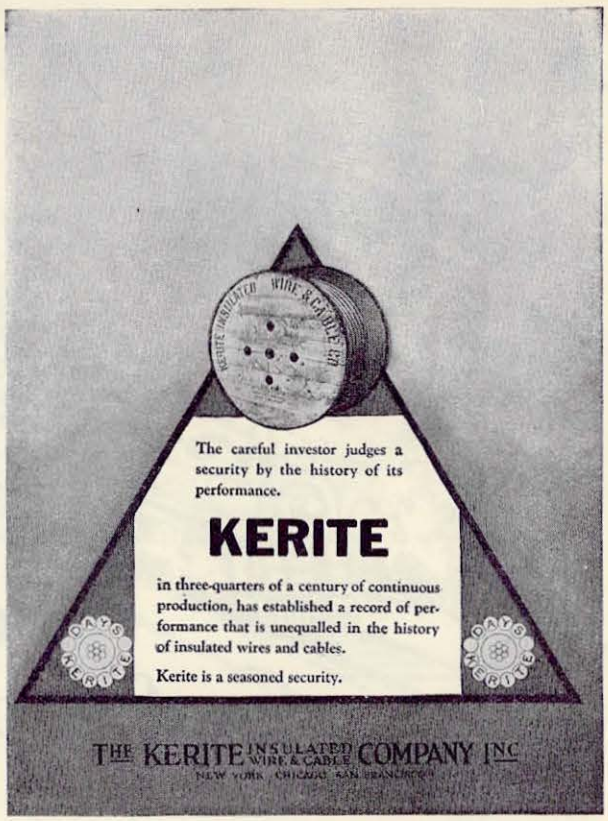
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KERITE
in three-quarters of a century of continuous production, has established a record of performance that is unequalled in the history of insulated wires and cables.
Kerite is a seasoned security.
THE KERITE INSULATED WIRE & CABLE COMPANY INC
NEW YORK CHICAGO SAN FRANCISCO

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FLEXIBLE CONDUITS
in place of Steam Hose

CONTROLS for Air
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For

Complete

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Freight Car Door Fixtures

Corrugated Steel Freight Car Doors

CAMEL SALES COMPANY 332 South Michigan Avenue CHICAGO, ILLINOIS

THE "FAIR"
RAILANTI-CREEPER
THE P. & M. CO.
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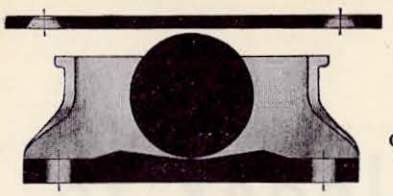

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SIDE
BEARINGS
Manufactured by
A. Stucki Co.
Oliver Bldg., Pittsburgh, Pa.
Canadian Representative:
The Holden Co., Ltd.,
Montreal, Can.

EDGEWATER STEEL COMPANY
PITTSBURGH, PA.
Details of our products appeared in the following issues of Railway Age during 1931 and 1932:
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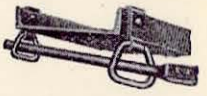
The "BUFFALO" Bottom Rod Support
Meeting A. R. A. Requirements.
Loop held by friction.
Obstructions swing it clear.
No bending or binding.
Made to fit any channel.
Permitting free brake movement.
Folds up for channel removal.



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NEW YORK
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1,300,000 cars equipped
ROLLER SIDE-BEARINGS
STANDARD CAR TRUCK CO.
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THE STRONG, LONG LIVED WEARING METAL
LOCOMOTIVE CYLINDERS AND CYLINDER PARTS
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The John Seaton Foundry Co.
The Locomotive Finished Material Co.
ATCHISON, KANSAS

WINE RAILWAY APPLIANCE CO.
TOLEDO, OHIO
Details of our products appear in following issues of Railway Age during 1932
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MANUFACTURER of Side Frames and Bolsters for 4-Wheel and 6-Wheel Freight Cars and Locomotive Tenders, A. R. A. Couplers, Yokes and Car Castings.

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Your professional card should appear in this section

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ENGINEERS
Inspection—Tests—Consultation
All Railway Equipment,
Structures and Materials
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22nd Floor Insurance Exchange
CHICAGO
Offices in all principal cities

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EDUCATIONAL

THE Railway Educational Bureau, Omaha, Neb., offers a distinctive education service for Supervisors and other employes. Write for FREE Special Bulletin.

REPRESENTATION

RAILWAY SALES AND ENGINEERING REPRESENTATION in the Pacific Coast and Mountain States territory. Former railway executive with several years railway supply experience wishes to take on one additional well established line of responsible manufacturer for intensive sales representation. Particularly well acquainted with operating, mechanical and maintenance of way departments. Address Box 1234, care Railway Age, Matson Bldg., San Francisco, Calif.

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IF YOU are open to overtures for new connection, and qualified for a salary between $2,500 and $25,000, your response to this announcement is invited. The undersigned provides a thoroughly organized service of recognized standing and reputation, through which preliminaries are negotiated confidentially for positions of the calibre indicated. The procedure is individualized to each client's personal requirements; your identity covered and present position protected. Established twenty-three years. Send only name and address for details. R. W. Bixby, Inc., 102 Delward Building, Buffalo, New York.

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New and Relaying — Frogs — Tie Plates — Angle Bars—Cars of all types including Tank Cars, Hart Cars, Flat Cars, Box Cars—Railway Equipment—Used Car Parts—Steel Sheet Piling, both new and used.
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New York, Los Angeles, Seattle, St. Louis
20 No. Wacker Drive Bldg. CHICAGO Paris, France
Pittsburgh, Houston, Portland, San Francisco

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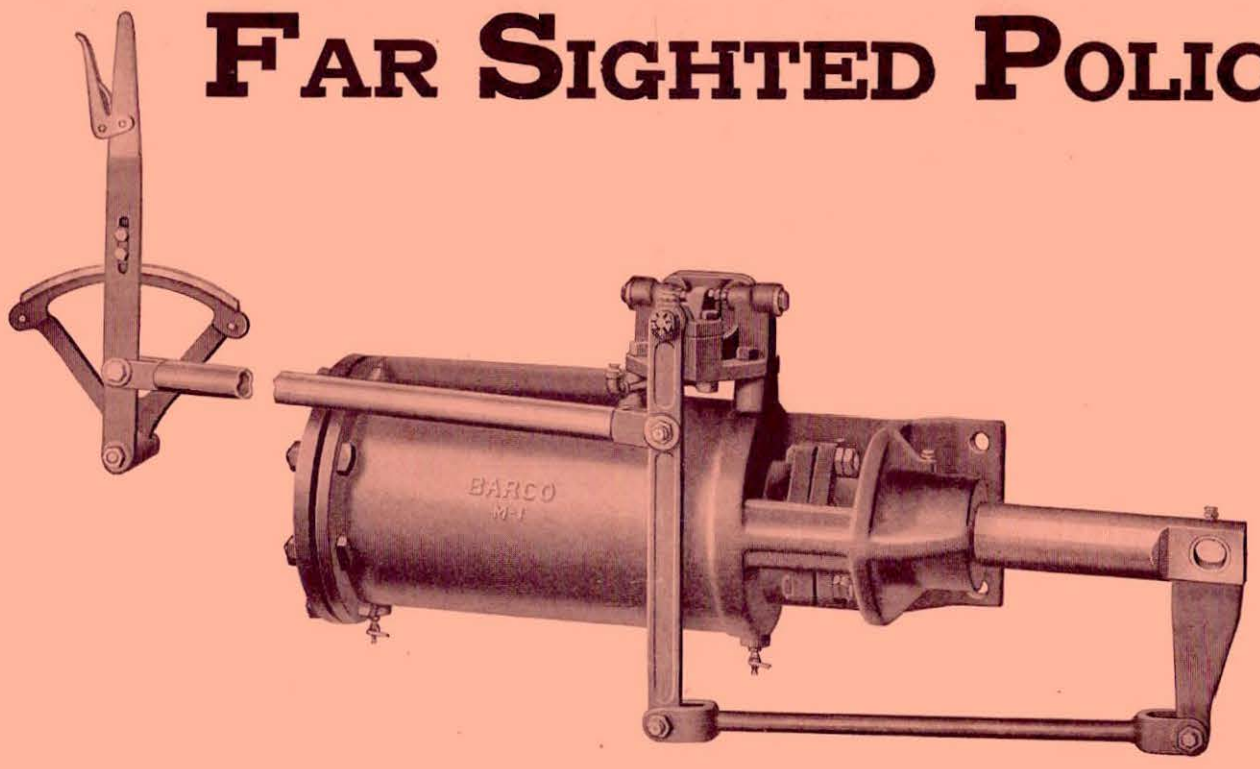
FAR SIGHTED POLICY



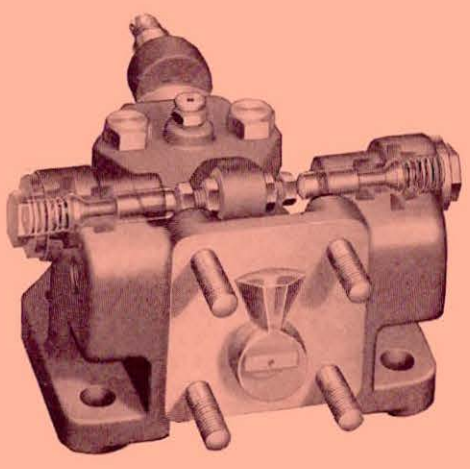
IN REVERSE GEAR SELECTION-

should consider the fact that while Reverse Gears may be purchased and applied to some unimportant power or to power that may be retired in a few years, the Power Reverse Gear should be selected that will give long trouble-free service with low cost of maintenance on large as well as small power.

Power Reverse Gears thus selected may later be used for replacement on more modern power, making a permanent investment for the Railroads.

Transferring present old or unsatisfactory gears to old power and applying new gears "if properly selected" to modern power may easily prove to be a paying investment.

The Barco gear with the new dual control valve and integral cast piston rod guide allows closely maintained selected cut-off and reduces packing maintenance.



Interior BARCO Dual Control Valve

Barco Power Reverse Gears provide

LOWEST FIRST COST COMMENSURATE WITH SATISFACTORY ECONOMICAL SERVICE

Barco Manufacturing Co.

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THE HOLDEN CO., LTD.

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Montreal—Moncton—Toronto

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BARCO

Self-Liquidating Projects

RAILWAY signaling installations are as a rule self-liquidating projects. The reports of the Committee of Economics of Railway Signaling of the Signal Section of the American Railway Association show that railway signaling installations are paying their way through the savings effected. These installations include:

AUTOMATIC BLOCK SIGNALS installed to reduce operating hazards and delays.

INTERLOCKINGS, CONSOLIDATION OF PLANTS, installed to make one plant do the work of two or more plants.

INTERLOCKINGS, AUTOMATIC, installed to provide automatic signal protection at railroad grade crossings.

CENTRALIZED TRAFFIC CONTROL installed for controlling sections of track from a central point, for directing the movements of trains by signal indications, and for the power operation of switches (to avoid train stops).

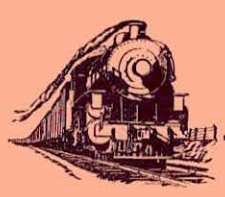
Centralized traffic control systems show the greatest operating efficiency per dollar of investment.

CAR RETARDERS installed to speed up freight car classification and to reduce yard operating hazards.

HIGHWAY CROSSING PROTECTION installed to provide continuous automatic signal protection at highway grade crossings and at minimum operating costs.

UNION SWITCH & SIGNAL COMPANY
Swissvale, Pennsylvania

GENERAL RAILWAY SIGNAL COMPANY
Rochester, N. Y.



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Signals Aid Modern Motive Power to Produce More Ton-Miles Per Train-Hour